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[COLONEL WM. H. POWELL, U. S. A., EDITOR.]

"I cannot help plead to my countrymen, at every opportunity, to cherish all that is manly and noble in the military profession, because Peace is enervating and no man is wise enough to foretell when soldiers may be in demand again."—SHERMAN.

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MILITARY IMPEDIMENTA AND INDIVIDUAL COMFORTS ON CAMPAIGN.

BY JAMES CHESTER, MAJOR OF ARTILLERY, RETIRED.

"WAR is Hell." So said one who knew it; one who had seen it without its ornaments; one who had walked in it day by day, and talked with it face to face for four long years; one who had found it to be a hideous monster of the pit. "The pomp and circumstance" were not there. The tinsel of parade was tarnished or altogether absent. "The gay and gallant tread" had become a painful dragging through mud and mire of tired and blistered feet—often sockless, sometimes shoeless, and always sore. Smiling faces had become stern. Tender hearts had hardened. And ordinary humanity had to hide its head.

Civilized and savage warfare differ only in degree. Both are barbarous. Every veteran knows it, but only the more impulsive among them proclaim the fact. And they rarely go into details. They rest content with a concise statement; and Society smiles, and wags its head, and misinterprets their meaning. Society admits that when men go out in multitudes to shoot and slash and cut and kill each other, the scene must be more or less horrible; but then the killing and the maiming are done in a gentlemanly manner and strictly in accordance with the laws of war. Perhaps Hell is a rather harsh name for it, Society thinks.

Perhaps Pandemonium—which means pretty much the same thing, but looks less like swearing—would be better. And so Society softens its conception of the horrors of war.

Society has some strange notions about war and warriors. The drawing-room darling is its ideal soldier—graceful, elegant, brave, generous, tender and true. There is nothing savage about him that Society can see. Neither is there anything savage about a smooth and smiling ocean. And yet, under altered conditions, it can be savage and cruel. Society should see its darling in what it prefers to call pandemonium. Grimy, rusty, hungry and angry he looks like a tramp. He has slept poorly, perhaps for weeks. Occasionally he has had an opportunity to eat, and has overdone it somewhat. Hunger and surfeit at irregular intervals are apt to ruffle the temper of even a drawing-room darling; and, when coupled with other discomforts, apparently transform his character. Perhaps he has not dared to pull a boot for a fortnight, and his temper has been affected. He is not so gentle as he used to be. Sentimental observers might even call him cruel. Society would find him sadly changed and less delightful than he used to be. But he is not changed. Only a little of his polish has been rubbed off. He has come under the orders of a very exacting master. Duty—stern, oppressive, tyrannical and cruel—claims him body and soul. And Duty has scraped the polish off him—has transformed him into something sadly like a brute. Take this to illustrate Duty's teaching: "Is that my brother lying in the ditch there and apparently bleeding to death?" says the erstwhile tender-hearted darling of Society. And Duty answers, "It is. But he will be taken care of. You are needed at the front. Move on." And, although Society hates to believe it, he actually moves on.

Society never sees a battle at its best, nor a battle-field at its worst. The fighting line is the most cheerful echelon of a battle, and Society or any of its representatives would there be out of place. The battle-field wears its grimmest mask when the day's fighting is entirely over. The darkness, which stops the slaughter, also hides the horrors of the field. By morning it is cleared up a little. The wounded are removed, and the dead men are collected and laid in rows with faces covered—

sometimes they are buried. Then Society, by its representatives, may see the field. They approach from the rear, where the remaining horrors are somewhat exaggerated, because concentrated, and they are shocked. Shocked at the masses of mutilated humanity. Shocked at the apparent heartlessness of the Hospital Staff, who move about amidst such misery and never shed a tear. Wounded, and apparently dying men, are lying about on the bare ground, and receiving no attention. The sympathetic soul of Society's representative demands to know, "Why this dying man should not have a hospital cot to lie on?" And the Hospital Staff answers: "My dear fellow, he has one; but it is in the General Hospital at the depot. He will be moved there the moment we get transportation. We cannot operate on him here."

But the answer is unsatisfactory. The representative sees nothing but heartless cruelty in it, and fancies that a clear case of criminal negligence has been proved. And so he writes a horrible description of what he has seen but does not understand, to the *Home Journal;* and Society reads it; and legislators question the Government about it; and a kind of pandemonium is produced in the home circle by everybody shouting for investigation, and the punishment of somebody who in reality deserves the nation's praise.

Of course, Society and its representatives would deny the charge, but in their inmost hearts, and all unknown to themselves, perhaps, they believe that civilized war should be a full-dress affair; that battles should always be fought on a fair day, and on ground suited to the purpose. They also believe that adjournment might be had, and should be had, whenever the number of wounded approached the capacity of the Hospital Staff. If, however, that cannot be effected, then provision should be made accordingly. Hospital accommodation, and a staff based upon maximum estimates, should be provided in advance. A wealthy nation professing Christianity cannot afford to be stingy in this regard. If one hundred nurses are deemed insufficient, send two hundred. Send enough. Send more than enough. So says Society. And the idea is beautiful in theory, but utterly impossible in practice.

Of course the opinions of a veteran of our Civil War may be

considered ancient history. The world has moved since 1861–65, and the veteran admits it. But principles never change, and the impedimentas of armies have not diminished. Indeed, modern armies have heavier chains to drag than those which hampered the armies of forty years ago. Still, one hesitates to cite familiar examples when they present themselves as apt illustrations of his theories, because they are old, and familiar, and American. To be effective they should be German. Since 1871, Germany has dictated the art of war to the world, and has naturally become somewhat dictatorial. Military men outside Germany are getting tired of it, and some even deny its orthodoxy. German military opinion is not so generally accepted as it used to be. It is still carefully read. It is thoroughly discussed; but it is accepted or rejected only on its merits. Nevertheless one feels that in discussing military questions, he must find his facts in some recent campaigns, and take his text from recent German opinion.

General von Schmeling, a German officer of some distinction, in criticising British army operations in South Africa (Berlin, *Lokal Anzieger*, January 14, 1900), takes for his text a remark which he attributes to Lord Kitchener. The time was immediately after General Buller's repulse at Colenso. Lord Kitchener had just been ordered to South Africa, and somebody seems to have asked him what he thought of the situation there. His answer, according to General von Schmeling, was, "The cart sticks in the mud." As a description of the situation, the six words quoted are excellent. Of course, there were other words in the answer. He went on to explain, also in few words, how the cart was to be got in motion again, and when it would reach its destination. But the words quoted become specially significant to anyone pondering over the problems suggested by the subject of this paper. Armies are unable to advance from a variety of causes. To diagnose the cause correctly is to discover the cure. Lord Kitchener diagnosed correctly.

"The cart sticks in the mud," as descriptive of the situation of an army on campaign, means much. It covers a multitude of military difficulties which few outside the military profession could either catalogue or comprehend. The more one ponders over it the clearer, more forcible and descriptive it becomes. It

is worthy of its reputed author, and accords so well with his known character that it almost proclaims its parentage by its face.

It is safe to say that the amateur critic who delivered himself so freely and fearlessly about hospital accommodation and the Hospital Staff, never pondered much over Lord Kitchener's diagnosis. He had heard the word "impedimenta" in connection with armies on active service, and naturally supposed that it meant baggage. But he had no idea, perhaps, that questions connected with its transportation give the General-in-chief more trouble than fighting the foe. If one were to say to him, "If all that you recommend were added to existing impedimenta, the cart would permanently stick in the mud," he would hardly believe it. He has never studied in detail the impedimenta of an army on active service. He has never amused himself by calculating the bulk of such impedimenta for an army corps able to operate five marches from its base; and the number of army wagons necessary for its transportation. He has never studied the preliminaries to such calculations. To intelligently organize the transportation for an army on active service, one needs to know the theatre of operations thoroughly. He must know, not only the kind, character and sufficiency of the roads, but the geography, topography and geological formations of the country to be traversed. He must form ideas, as correctly as possible, about the dangers to which his trains would be exposed, and the kind and strength of guards for his convoys, camps and bivouacs. And lastly, and most important of all, he must determine what length of chain the army would be able, under the circumstances, to drag after it, without dangerously affecting its efficiency.

The problems of impedimenta naturally divide themselves on the lines of the great supply departments; the construction departments; the signal department; and the medical department. The supply departments again are sub-divided into the Subsistence Department; the Quartermaster's Department, and the Ordnance Department—the latter including artillery and small-arm ammunition trains. The Construction Departments include the artillery park; the engineer depot; ponton trains; railway construction trains; and telegraph construction trains.

The Medical Department requires ambulance trains; regimental hospital trains; division hospital trains and the General Hospital train.

Each of these—and the list is doubtless incomplete—presents a special problem, which must be solved with due consideration to the length of chain which the army is able to drag. No margin of safety can be allowed. Every wagon is a link in the chain, and there is a certain link which one may call "The *Point of Possibility*." If the chain of impedimenta extends beyond that point, "The cart will permanently stick in the mud."

Before the amateur is qualified to criticise understandingly, he should amuse himself for a month or so with the problems of impedimenta and transportation for an army on active service. He should carefully classify the impedimenta under the headings, *Indispensable*, *Necessary*, and *Desirable*. Then turning to the schedule of indispensable impedimenta he should calculate its gross weight and determine the number of wagons required for its transportation. This involves a study of the theatre of operations, its topography, roads, obstacles, and geological formations—the last in view of the probability that the army trains will have to cross the country where there are no roads. The wagon load being determined—and it should be a light one—the number of wagons necessary for the transportation of indispensables is readily arrived at. Then comes the problem of organization. It is just as impossible to manage a multitude of wagons on the march, or in camp or bivouac, as it would be to manage a multitude of men on the march or on the battle-field. Organization is indispensable. And the organization means more than cutting a string into equal lengths and assigning commanders to the sections. The contents of the wagons must be considered. Ammunition, as the most indispensable of indispensables, should be given precedence. Still all the ammunition trains cannot be placed in front. Subsistence for the men and forage for the animals must receive consideration. It is easy to see that skill and experience are indispensable in the organization of army trains, and—if the army has to make a sea voyage—in the stowage of army transports. An army train, if it consists of six-mule teams, as in American trains, should contain twenty wagons, and be commanded by a

commissioned officer. It should also be divided into two sections, each in charge of a wagon master. The leading trains on every road should consist of an ammunition and a subsistence section. Subsistence wagons should be packed with all the components of the field ration in proper proportion, so that a subsistence wagon would mean a certain number of rations complete.

If it be desirable that an army should be able to operate a certain number of marches from its secondary base—that is, away from the railroad which connects with its primary base—then the subsistence wagons should carry twice as many days' rations for the troops, plus its own guards and operators, and also forage for its animals for the same period. Manifestly the problem presented by the subsistence trains is one of considerable magnitude, and not to be solved off-hand by anybody.

The ammunition trains present a simpler problem. The number of rounds per man of small-arm ammunition to be carried in the wagons, and the number of rounds per gun of artillery ammunition, are prescribed by the General-in-chief. The practical wagon-load having been determined, the number of ammunition wagons required is easily arrived at, and organization is effected as in the subsistence trains.

The impedimenta classified as "*Necessary*" consists of hospital trains, ponton trains, signal trains and headquarter trains. Those classified as "*Desirable*" are quartermaster's supply trains, and trains carrying the baggage of individuals and organizations.

One need not enter into the organization of these trains. Enough has been said to indicate what their organization ought to be, and they have been introduced by name into this paper in order that the amateur critic may see their relative importance, and perceive in advance where the pruning-hook should be applied when that operation becomes necessary.

When all calculations have been made and all impedimenta provided for, the chances are that the *Point of Possibility* will have been passed, and that the pruning process must be resorted to. There are many reasons for this. No matter how efficient the staff of an army may be, unauthorized impedimenta will find its way into army trains or transports. And this condition

is common during the first few weeks of a campaign, and is aggravated where the theatre of operations has to be reached by an ocean voyage. Individuals and organizations are permitted to embark with the full campaign allowance of baggage prescribed by the Regulations. This can be carried easily enough, so far as waterways and railways are available. But when the theatre of operations is reached, and the baggage comes to be packed in army wagons in limited loads to enable the wagons to travel where there are no roads, then it too frequently is found that "The cart sticks in the mud."

Most military critics, when they find that an army is unable to advance, look for the cause in the opposing army, and, as a rule, they will find it there. But there are exceptions to the rule. The cart not unfrequently sticks in the mud because the impedimenta of the army has passed beyond the Point of Possibility. And this may happen without the violation of any Army Regulation. If the roads are bad or non-existent, and the wagons provided are strictly such as are prescribed by Regulations for an army operating in a country covered by a network of roads, the wagons will be overloaded, and the trains will stick in the mud. Again, if extra wagons be called into service and the loads are lightened within limits, the chain that the army has to drag will be so lengthened that not only the trains but the army will stick in the mud. And this is more likely to occur when the trains have to travel through an enemy's country. It is so easy to surprise and destroy a train when every man, woman and child along its route are spies upon its movements. And so every train must be guarded, and every bridge and common camping ground; and the country must be scouted to the right and left, at least one cavalry march each way; and the troops for all these duties must be drawn from the fighting force; and it is easy to see that the army communications may be so extended, whether railways or roadways, that the guards required will sap the strength of the fighting force, and finally cause the army to stick in the mud.

It takes some time for inexperience to realize the disadvantages of carrying a full kit. On Indian campaigns the lesson is soon learned; but during our Civil War it took two years to learn it. But it was learned thoroughly. The reduction of

impedimenta to its lowest terms was always the first problem in a campaign. In the cavalry everything outside "Indispensables" was reduced to zero, and even "Indispensables" were sadly curtailed. The writer remembers a division commander in the cavalry corps who had not so much as a dog tent to crawl into when it rained, and many an officer had to equip himself in the costume of a Blanket Indian when his shirt was in the wash. "Desirables" had disappeared from the baggage trains, and much that was "necessary" had to be sent to depots before the campaign began. An army, like an athlete, must strip itself before entering the ring.

An army perfectly able to deal with its adversary if it had freedom of manœuvre, may be unable to advance because it is without transportation for "indispensables": and it may be unable to advance because the chain of its impedimenta is too heavy for it to drag. In the former case a wise commander will wait until sufficient transportation is furnished; in the latter case the pruning-knife must be applied. Both alternatives mean delay, and an aggressive army that delays its attack when in touch with its adversary, is already beaten in the eyes of the laity. Did not the crazy cry of "On to Richmond" drive an American army into disaster in 1861? Then and now, sound military principles have sometimes to yield to other influences, which, although unmilitary and unwise, cannot be ignored.

"The cart sticks in the mud" correctly described the condition of the British armies in South Africa in January last. Their transportation had not yet arrived. Mules had to be bought in distant countries, and months were required in which to transport them to the theatre of operations, and properly organize and equip trains and load them for the march. During this period the armies were tied to the railways. The Boers knew they would be, and believed they would always be. Like General von Schmeling and all the critics of Continental Europe, they thought the cart had permanently stuck in the mud. Their flanks were secure. Turning movements were impossible. The front alone had to be guarded, and that was an exceedingly simple problem. South African railways traverse regions abounding in positions capable of stubborn defense. It would be difficult to find on any of them a ten-mile stretch that

did not contain positions almost as defensible in their natural condition as fortresses would have been. Turning movements being for the time out of the question, the problem before every British army in South Africa was equivalent to forcing a passage through a fortified defile. That this was attempted by sane and scientific commanders in some cases must be accounted for by other than military reasons.

By the time Lord Roberts had gotten the reins of command firmly in his fingers the embargo upon manœuvre had been removed. Hence his brilliant movements, which resulted in the relief of Kimberley, the capture of Cronje's army, the occupation of Bloemfontein, and practically the relief of Ladysmith. But the loss of a large convoy had crippled his army, and it again stuck in the mud. It was not the strength of the army in his front, nor the numerical weakness of his own army, that caused the long delay at Bloemfontein. The construction corps had much work to do, and the transportation had to be reorganized before any further advance could be attempted. Bridge and railway building might be safely left in the hands of the corps which had been trained to the business, but reorganizing the transportation might involve pruning operations which would require the hand of a master. And so Lord Kitchener was assigned to the work.

It is easy to understand why Lord Kitchener was unpopular in the army of South Africa. Anybody would have been unpopular who had his duty to do. An interview between him and the amateur critic who demanded a certain increase in hospital accommodation, would have been interesting. What would the critic have cared for the classification of impedimenta? He would have demanded to know if anything could be more indispensable than the humane treatment of wounded men. And that would have closed the argument. The army had been sent to South Africa for a special purpose which the critic did not seem to comprehend, and the General had no time to enlighten him. And so he proceeded to prune.

The pruning process has not been described in detail; but one can readily imagine that the impedimenta classified as *Desirable* would receive attention first. If after reducing that to its lowest terms the trains were still too long, then those classi-

fied as *Necessary* would have to suffer. Sick and wounded are impedimenta which an army must get rid of as rapidly as possible. Of course the transportation which brings supplies to the front should always carry sick or wounded to the rear; but as a result of battles or epidemics, hospital camps at or near the front will become congested, and temporarily much hardship and misery have to be endured. They constitute some of the horrors which human ingenuity as yet has been unable to eliminate from the practice of war. Unfortunately they are the very things which first strike a visitor's eye. They lie directly in his path. The army people—staff and line—are used to such sights, and their apparent indifference to the suffering around them suggests cruelty and inhumanity to the visitor. One cannot quarrel with his views on the subject. They would be creditable in any man. And they are not rare. Everybody has them, and soldiers are no exception to the rule.

After the pruning had been accomplished and the transportation had been reorganized, Lord Roberts' army started forward like a giant refreshed. No longer tied to the railway, flanking columns swept outward to the right and left, threatening the natural fortresses which lay in their path with envelopment, isolation and capture. The cart was in motion again, and henceforth made very creditable progress, and reached its destination in about half the time prescribed by Lord Kitchener.

The advance of Lord Roberts was so rapid and overwhelming when once his army was in motion, that one cannot help asking himself what caused the long delays with which his brilliant campaign is punctuated. After a careful study of his operations, the only answer that arises in one's mind to that question is, *Transportation.* The cause of his delays was not the army in his front, nor the condition of his own army. It was the wagon trains.

When one has reached this conclusion, the question naturally arises in his mind, How could the German general have been so mistaken? He seems to have accepted Lord Kitchener's diagnosis as correct. He seems to have collected his facts from English sources. He seems to have applied correct military principles in his reasoning. And his conclusion was that the cart had permanently stuck in the mud—or as he for-

cibly puts it at the end of his discussion, "And so the devil may draw the cart out of the mud."

No doubt General von Schmeling's mind was somewhat warped by his environment. The Continental press was uniformly anti-British. One readily concedes that he meant to be fair. But his surroundings, the professional atmosphere in which he moved, and the wonderful information which he managed to cull from English newspapers, led him astray. A military critic should be extra careful in collecting his facts. The Government and the army staff give him no help in that direction. On the contrary, they try to conceal all important facts. And so General von Schmeling was driven to the only remaining fountain of information, the press. There he could find all kinds of it. That he selected the kind that pleased his mental palate best is not to be wondered at. And yet he ought to have known that the authors from whom he drew were not competent military critics nor reliable reporters. Of course, he might say in defense, "Their statements were never officially contradicted." And that would be true. But were they worth it?

General von Schmeling had one fact to argue from, and that seems to have come from Lord Kitchener. To this he added information collected from untrustworthy sources, all of which was untrue. This was his first and perhaps his greatest mistake. Then he assumed that it was the Boer armies that blocked the advance. This was an error into which an amateur might be expected to fall; but that a German expert should stumble into it without due investigation, is almost as bad as Buller's attack on Colenso. With such data before him he discourses very wisely upon the impossibility of driving the Boers from the many impregnable positions which barred the way to Bloemfontein and Pretoria, and finally reaches the conclusion already quoted.

General von Schmeling's ideas were the ideas of Continental Europe. They existed before the struggle began and were believed to be proved beyond controversy by the repulse at Colenso. No doubt Presidents Stein and Kruger heard them from their advisers, and at last were convinced by them, that they might safely defy the British Empire. Hence the war.

The arguments were convincing but the foundations upon which they rested were false. If General von Schmeling, or any other Continental expert, had been told that the British Government could throw 200,000 men into South Africa in a certain number of weeks, he would have laughed in the face of his informant. When he was told after Colenso, that the cart would be extricated out of the mud, and would reach its destination inside a twelvemonth he practically exclaimed, Then the devil will have something to do with it.

Of course General von Schmeling does not believe that the devil ever takes an active part in military operations. He is a scientific soldier and meant to say that the British Empire could not furnish force enough to set its South African armies in motion again. But the introduction of the devil as a possible ally of the British, saves his reputation—or will save it on the Continent of Europe. His prognosis has been shattered by events; but he can still say the devil did it.

When one gets on an interesting subject, even if it is not strictly germane to his theme, he is apt to wander, and ought to ask the pardon of his readers. But impedimenta, transportation allowances, indispensables, necessaries, and desirables on campaigns, are dry subjects in spite of their importance, and must be seasoned somewhat to please professional palates. Professional soldiers know that the art of managing army transportation can only be acquired by experience, and that its practice requires considerable hardness of heart. Sick and wounded men with an army on campaign have always suffered more or less, and they will continue to suffer until swords are beginning to be beaten into pruning-hooks. Not that their comrades are cruel. Not that their governments are criminally careless of their comforts. But because suffering is one of the horrors of war which human ingenuity has been unable to eliminate. Sick and wounded men are encumbrances to an army and it is a duty which that army owes to itself and the government which it serves to get rid of them as rapidly as possible. True philanthropy should apply itself to increasing and improving the means of transportation of the sick and wounded to the rear, where all possible comforts await them, and not in transporting a meagre portion of these comforts to the front where they

can reach only a few, and are more apt to arouse discontent than to create comfort.

Every sick man and every wounded man add to the impedimenta of an army, and necessarily lengthen the chain which it has to drag. Their treatment is not exclusively a question of philanthropy. The mobility and efficiency of the army may be involved. Every commander therefore gets rid of his sick and wounded as rapidly as possible. Every empty wagon and every empty train going to the rear are loaded with them. As a rule there are no hospital railway trains, although they have appeared as exceptions in some recent military operations, and have done an immense amount of good. But their multiplication may be inadvisable. The capacity of a single railway track is limited, and the indispensable impedimenta for an army of any size are immense. No matter how philanthropic and tender hearted a General-in-chief may be, the object of his army's existence will determine his actions, even if the disabled men of that army have to suffer. When it becomes necessary to curtail impedimenta, and that classed as "desirable" has already been reduced to its lowest terms, then necessaries must suffer, and every clip will cause discomfort. The movable hospitals are a heavy burden and they sometimes have to suffer—a necessity which civilian philanthropists consider to be an outrage on humanity. But war itself is an outrage on humanity, and death and discomfort are its intimate associates. The object of all its grim paraphernalia is victory, and nothing in the hour of trial which does not directly contribute to that end can expect to receive much consideration. The individual comfort of well or wounded soldiers is a question of secondary importance while victory trembles in the balance.

PORTO RICO AND A NECESSARY MILITARY POSITION IN THE WEST INDIES.

By Major W. A. GLASSFORD, U. S. V., Signal Officer Department of Porto Rico. (Captain Signal Corps, U. S. A.)

THE conquest of Porto Rico was not made on account of its strategic value; it was forced upon the United States by general political conditions, circumstances wholly disconnected with such a consideration. Having acquired the island, however, it is necessary to retain it. Our relations with other American governments now demand this occupation. It is therefore necessary to examine its value as a military post.

It is clear from the conditions obtaining in the island, with its dense population, extremely difficult interior communications, a long coast line and an absence of ports for large vessels, that it cannot easily be defended. The general structure of the island, consisting for the most part of steep mountain slopes, together with a wet climate, make the construction and maintenance of many roads across it too expensive for the limited resources of the inhabitants, while any railroad must necessarily follow the coast line and generally in a position exposed to the attack of an enemy. At present, on account of bad roads, military forces are sent from one part of the island to another by sea transportation, which system of transportation could not be considered in case of a blockade. From the nature of the coast, and the total absence of harbors, with the exception of San Juan, fortification would be restricted to this one place. This harbor, moreover, is suitable only for the entrance and protection of vessels of light draft.

The island does not produce sufficient food for its million of inhabitants, and in view of the probable greater development of special cultures by the introduction of American capital, it is not likely to do so in the future. The products, such as coffee, sugar, and tobacco, must always first be exchanged for food supplies. Therefore, food supplies will never be found in the island in sufficient quantity to enable the inhabitants to sustain

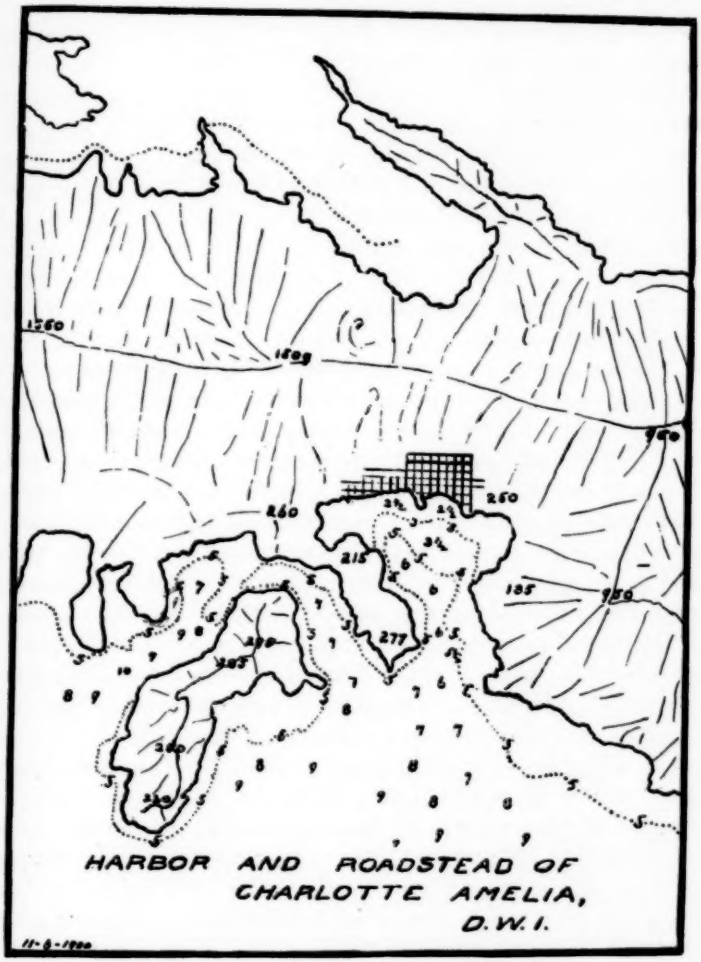
a siege, unless so accumulated for this special purpose. In case of war the food for a million of people, for a considerable length of time, would have to be provided in a climate where it is very difficult to preserve supplies. A blockade of Porto Rico without this special accumulation of food would produce an immediate famine.

Another consideration, which is not of inferior importance, is the fact that the defense of the island will always devolve upon the American soldier. It would be impossible under any circumstances to recruit a force among the natives which would be of any practical use in resisting invasion. The physical and mental qualities of the inhabitants unfit the greater part of them for the work of a soldier, and even if they were so fitted, they could not be relied upon. A strong garrison of American troops in Porto Rico will always be necessary for its defense against invasion, and for the maintenance of public order. It is not while a strong garrison is here that there would be any likehood of serious interior trouble, because no revolutionary force of any considerable power could in such a case be concentrated in any locality with sufficient supplies to last for a week; but if the garrison were to be withdrawn from the island, a revolt would quickly follow.

So much for the defense of the island. Its value as a strategic point in the West Indies is evidently much diminished by the conditions above described. Neither Porto Rico nor any of its outlying islands possess harbors or estuaries suitable for the coaling of battle-ships. Consequently, the possession may be said to be practically useless as a coaling station.

What would serve our purpose, in a military point of view, much better than Porto Rico, in this part of the West Indies, would be a well protected deep harbor in some small island that contains few inhabitants, a point that can be fortified and supplied to resist a long siege.

Our real object now should be to establish a firm military line in the West Indies. Our recent acquisitions might at a first glance appear to furnish us the necessary sites for accomplishing this purpose, but a closer investigation reveals the necessity of the strong points of such a line being isolated from the population. By way of illustration, we may take Gibraltar with its


1760
1809
260
250
215
185
277
HARBOR AND ROADSTEAD OF
CHARLOTTE AMELIA,
D.W.I.

population of 14,000, besides the troops, which number may be cared for throughout a long siege by means of provisions previously accumulated and stored upon the Rock. Such a provision for Porto Rico, under similar circumstances, could not be thought of for a moment, because of the great number of its inhabitants. Consequently, our flag in this part of the world, as well as Porto Rico, can best be defended by an isolated strong position in the neighborhood. With such a position made impregnable it may be concluded that were San Juan simply fortified against a sudden attack, and considering that Porto Rico possesses no military resources to attract an enemy and no harbors in which battle-ships might be coaled and repaired, that no probable enemy would care to waste his strength in capturing what could not possibly, under such circumstances, be of any use to him.

The island of St. Thomas offers conditions suitable for developing a first-class military outpost. This island possesses all the natural advantages enabling it to be converted into a second Gibraltar. The structure of this narrow island, with its long central ridge, having a general elevation of about a thousand feet, with some points 500 feet higher, is especially adapted for the emplacement of fortifications commanding both shores at the same time, making it extremely difficult for an enemy to approach or to obtain a foothold upon the island. The elevated ground in the immediate neighborhood of the excellent roadsteads which this island affords, makes the question of harbor defense a comparatively easy one. This position with its few inhabitants could easily be provisioned for a long siege. The harbor of Charlotte Amelia and the numerous sheltered places about the island afford 6 and 7 fathoms of water; besides, this harbor and the roadsteads are on the southern side of the island completely protected from the prevailing strong winds. If this place were strongly fortified and provisioned, it would be necessary for an enemy contemplating a descent upon Porto Rico to first take it into account.

This location on the northeast rim of the Antilles is in close proximity to many of the passages into the Caribbean Sea and affords an excellent point of observation near European possessions in the archipelago. While being near other islands, St.

Thomas is practically in the open ocean, and permits the entrance and egress of a fleet without its being observed. It is also a centre of the West Indian submarine cable systems, being about midway between the Windward Passage and the Trinidad entrance to the Caribbean Sea.

The strategy of a position at St. Thomas in regard to an interoceanic canal across the isthmus of Panama need not be specially explained further than to say that this point lies in the direct track of European traffic to the isthmus, and having the same distance as New York from nearly all the ports of Europe.

GUNSHOT INJURIES BY THE RIFLES OF REDUCED CALIBRE.—Louis A. La Garde discusses the effects of the seven-millimetre Mauser rifle as observed by him among fourteen hundred wounded in the Spanish-American War. The wounds of entrance and exit and the narrow track of the missile favored rapid healing, and infection was seldom noticed. Of the fourteen hundred wounded none died of external hæmorrhage, nor was it necessary to ligate a vessel for alarming hæmorrhage on the field. The gunshot injuries of the diaphyses were as a rule attended with but little comminution. In wounds of the principal joints, including epiphyses, clean-cut perforations without fracture were the rule. Of thirty-one cases of gunshot injury of the head, 58.1 per cent. ended fatally. Fifty-three penetrating wounds of the thorax were observed, with a mortality of 24.5 per cent. Penetrating gunshot wounds of the abdomen were very fatal. Of forty-one recorded cases twenty-nine ended fatally. The value of skiagraphy and the use of the fluoroscope were exhibited in locating missiles, in determining the extent of bone lesion, in detecting supposed cases of guttering or perforation of the long bones without fracture, and in probable lesion to nerves and tendons by loose spicula of bone.—*Boston Medical and Surgical Journal.*

NAPOLEONIC STRATEGY.

By FREDERIC LOUIS HUIDEKOPER.

STRATEGY is the art of manœuvring troops in the theatre of operations and beyond the presence of the enemy.* "The Theatre of War is the province of Strategy—the Field of Battle is the province of Tactics."† The principal, if not the whole, object of Strategy is so to direct the movements of one's own forces, as to be, in so far as possible, superior to one's adversary at the decisive point, or points, in the theatre of operations.‡ "All operations must ultimately rely for success upon power of fighting; for it is of no avail to conduct an army into situations which it cannot maintain in battle,"§ and a careful study of the works left by the great Napoleon cannot fail to convince one that the fundamental principle upon which he laid the most stress, for him the whole art of war and secret of success, consists in being strongest at the decisive point.‖

It is an acknowledged maxim in war that, while tactics are constantly being modified, the object of Strategy never changes. It therefore follows that the reasons for the success of the operations of some commanders and the failure of others are to be found in the different means by which they sought to attain the same object.

Prior to 1796 Strategy can hardly be said to have been thoroughly comprehended except by a few master-minds. The

* Compare Jomini, "Art of War," p. 13.

Bigelow. "Principles of Strategy," p. 17. Derrécagaix. "Modern War." Part 1 (Strategy), pp. 3 and 4. Dufour. "Principles of Strategy," pp. 7 and 8. Halleck. "Elements of Military Art and Science," p. 37.

Von der Goltz. "The Conduct of War," p. 25.

† Hamley. "Operations of War" (5th edition), p 59.

‡ Compare Jomini, p. 113; Hamley, p. 59; Mercur, "Elements of the Art of War," p. 16.

§ Hamley, p. 59.

‖ Compare Hart. "Reflections on the Art of War," p. 72. *Vide* especially Napoleon, "Notes sur l'Art de la Guerre," in his Correspondence. Vol. 31, pp. 347–365.

scarcity of detailed works on the campaigns of Alexander the Great, Hannibal, Cæsar, Gustavus Adolphus and Turenne—those great masters of the art of Strategy—and the military education of the times, made the study of Strategy exceedingly meagre and difficult. Of the campaigns of Eugene more was known, but even in the middle of the eighteenth century so little comparatively was known of the principles of Strategy that an authority so great as Marshal Saxe wrote that "All the other sciences are established upon fixed principles and rules, while this alone remains destitute."* War was learned by actual practice in the field, and amid the constant warfare but little opportunity could be found to study the fundamental principles underlying the formal and pedantic rules brought into vogue by blind addiction to arbitrary maxims and ancient precedent. Political reasons, moreover, played such an important rôle that true Strategy became so subordinated as almost to be lost sight of.

The advent of Frederick the Great shed new light upon the art of war and soon attracted the attention of Europe to his system of extending and perfecting all the physical means in war. With the blindness in which mediocrity always follows genius, the most minute details in the equipment and dress of the Prussian army were adopted *in extenso* under the erroneous supposition that therein lay the secret of his success. Great as the military ability of Frederick unquestionably was he cannot be compared dispassionately with the great masters of Strategy. "He often put into practice the principles of these great captains,"† but even Napoleon and Jomini, his two most devoted admirers, do not consider him a master of the strategic art. "He put his especial confidence in the discipline of his army."‡ "Out of sixteen battles,§ Prussia gained eight and lost eight. There is not one of these battles in which the king employed new tactics. He did nothing which has not been practiced by ancient and modern generals in all centuries."‖ The oblique

* Marshal Saxe. "Reveries or Memoirs upon the Art of War." Preface to the edition of 1557.

† Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol 31, p. 335.

‡ *Ibid.*

§ Fought during the Seven Years' War.

‖ Napoleon. "Précis des Guerres de Frédéric II." Corresp. Vol. 32, p. 239.

order over which Europe went mad, until Austerlitz dealt its death-blow, is as old as the battle of the Granicus.* This oblique order was used by Cyrus at the battle of Thymbrus, by the Gauls and Belgians at the Sambre against Cæsar, by Turenne at the battle of the Downs, by Marshal Luxembourg at Fleurus, by Marlborough at Höchstädt, by Prince Eugene at Ramillies and Turin, and by Charles XII at Pultawa. "If Frederick invented this manœuvre he invented war, which unfortunately is as old as the world."† In reality, the king laughed in his sleeve at "the parades of Potsdam" and the infatuation of the young European officers for this movement. "A profound examination of the manœuvres of this war ought to have enlightened these officers, and this should have succeeded in making their illusions vanish, viz.: that Frederick never manœuvred except by lines and by the flank, never by deployments."‡ "The secret of his success lay, not so much in judicious movements in the theatre of war, as in the use he made of the flexibility of his army as compared with the armies of his adversaries. It was by his successes in the fields of battle, rather than by his plans of campaign, which were often faulty, that he finally emerged victorious from the struggle, with a military renown unrivalled in his generation."§ In the Silesian wars he demonstrated, by the freedom of action given to his cavalry leaders, the capability of horsemen, with the result that no army has since had a leader or cavalry superior to the immortal Seydlitz and his splendid squadrons. Frederick's forte lay in his remarkable exposition of the possibilities of Tactics and discipline, and his place in military history is that of their greatest exponent.

The history of every era has been dominated by the influence of some one master-spirit, and, just as Frederick the Great stands preëminent in the realm of Tactics, Napoleon embodies the highest development of Strategy. It is comparatively easy to trace in the growth of every great scientific movement the gradual steps leading to its maturity, and, as a rule, it is only in the last stage of its development that a science finds its

* Fought by Alexander the Great against the Persians, B. C. 334.
† Napoleon. "Précis des Guerres de Frédéric II. Vol. 32, p. 239.
‡ *Ibid.*, p. 243.
§ Hamley, p. 340.

greatest exemplar. A dormant movement may be brought into activity by a genius, but a greater genius and a concurrence of favorable circumstances are necessary for the attainment of perfection. Military engineering, awakened by Micheli, Albrecht Dürer, and Maurice of Nassau, culminated in Vauban;* Tactics revised by Maurice of Nassau, Gustavus Adolphus, and Marlborough reached a remarkable state of perfection under the Prussian king; Strategy, beginning with Alexander the Great and Hannibal and brought into renewed activity by Turenne and Prince Eugene, attained its zenith in Napoleon. The study of war was taken up with new interest and some semblance of system in the middle of the sixteenth century with the result that Tactics reached an extraordinary state of efficiency under Frederick the Great. Since the scope and magnitude of Strategy is so much greater than that of Tactics its development necessarily and logically followed that of Tactics. The tremendous convulsions of the French Revolution created opportunities for, and brought to light, men who, for number and ability in diplomacy, statesmanship, and war, both terrestrial and maritime, made the subsequent era one of the most remarkable in history. The Revolution, as sceptical of military as of political traditions, asserted in practice the most subversive creeds, and the great struggles which ensued called into activity all the military energy and talent of Europe, with the result that the metaphysics of war, the science of vast operations conducted on a scale hitherto unknown, the massing and manœuvring of immense armies, which had previously been in a state of comparative infancy, advanced in a surprisingly short time to a remarkable degree of perfection. In truth, this period afforded examples of the utmost limits to which man can reasonably be expected ever to attain, either in his capacity of general or of simple soldier.† The result was the production of a commander of the most consummate genius the world has ever seen. Napoleon, the child and servant of the Revolution, became its master and proved to be "the man of Destiny."

* At St. Helena Napoleon declared that "the principles of campaign fortification need to be perfected. This part of the art of war is susceptible of making great progress." "Notes sur l'Art de la Guerre." No. 32, in Napoleon's Correspondence, Vol. 31, p. 416.

† Graham. "Elementary History of the Art of War," p. 202.

Before his appearance, strategy had been reduced to rules as pedantic and arbitrary as Tactics had been prior to the time of Frederick. These rules, founded upon precedents laid down by mediocre generals, were regarded as immutable principles from which there could be no departure. Napoleon applied to the science of Strategy the Revolutionary doctrines with which he had been imbued, taking great care, however, never to violate the few great fundamental principles which he had learned from the campaigns of great generals like Alexander, Hannibal, Cæsar, Gustavus Adolphus, Turenne, Prince Eugene, and Frederick, of which he had made a most profound study. At the close of his life he said at St. Helena, that "the history of these eighty-three campaigns would be a complete treatise on the art of war; the principles which one should follow in a defensive and offensive war would flow from them as from a spring."* Rejecting the arbitrary rules with which the pedantry of the seventeenth and eighteenth centuries had trammelled the subject, his vast insight, originality, and power enabled him to evolve its true principles, and, by a judicious application to the art of war, to found a new system of Strategy which has justified the use of new terms, new rules, and new exceptions.

The most important of the general principles which he learned from his exhaustive study of previous great commanders are embodied in his criticism of Cæsar's campaigns: "The principles of Cæsar were the same as those of Alexander and of Hannibal: *to keep his forces united, not to be vulnerable on any point, to move with rapidity on the important points*, to rely on the moral means, the reputation of his arms, the fear which he inspired, and also the political means to keep his allies loyal and conquered peoples obedient; *to give himself all the chances possible to assure his victory on the field of battle—i. e., to unite there all his troops.*"† The application of these rules to Napoleon's own campaigns and the system which he inaugurated have been thus described: "Rejecting old systems, which were satisfied with the capture of one or two points, or with the occupation of an adjoining province, he was convinced that the best

* Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 347.

† *Ibid.*, pp. 353–354. The italics are ours.

means of accomplishing great results was to dislodge and destroy the hostile army, since States and provinces fall of themselves when there is no organized force to protect them.* To detect at a glance the relative advantages presented by the different zones of operations; to concentrate the mass of the forces upon that which gave the best promise of success; to be indefatigable in ascertaining the approximate position of the enemy; to fall with the rapidity of lightning upon his centre, if his front was too much extended, or upon that flank by which he could more readily seize his communications; to outflank him, to cut his line, to pursue him to the last, to disperse and destroy his forces—such was the system followed by Napoleon in his first campaigns."†

It has been asserted that Napoleon once declared that he recognized no system or rules of Strategy beyond operating with a view to victory.‡ This, however, is not quite correct.§ It is true that the Emperor himself wrote at St. Helena that "Tactics, evolutions, the science of the engineer and of the artilleryman can be learned in treatises, almost like geometry; but the knowledge of the higher branches of war can only be acquired by the study of the history of the wars and the battles of great captains, and by experience. There are no exact determined rules; all depends upon the character which Nature has given to the general, upon his qualities, his defects, upon the nature of the troops, upon the range of arms, upon the season, and a thousand circumstances which result in things never concurring."‖ By this statement Napoleon undoubtedly meant

* Compare Prince Kraft zu Hohenlohe-Ingelfingen, "Letters on Strategy," p. 101. Axiom No. 2. "The hostile army is the first object of Strategy." Also Derrécagaix, part I., p. 205. "The principal army of the enemy ought always to be the first objective."

† Jomini. "Art of War," p. 89.

‡ Hohenlohe-Ingelfingen, p. 99.

§ Prince Kraft has confused system with plan, for in support of his statement he quotes Napoleon as saying, "I never had a plan." Plan and system are quite distinct. In the campaign of 1796, when Würmser advanced south, Bonaparte, on the defensive, had no plan until the Austrian attack had sufficiently developed for him to comprehend its direction and force. (*Vide infra* p. 36.) No one could however possibly accuse him of having no system by which to operate when he learned of Würmser's blunder.

‖ Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 365. The same idea is expressed by Hohenlohe-Ingelfingen when he says (p. 101), "that one may not follow a fixed system but must always rely on sound judgment." Axiom of Strategy, No. 4.

that, in war as in everything else, circumstances modify principles and that it is impossible to formulate rules which admit of no exception. His Commentaries, however, are full of the "rules of war" and principles to be observed which demand "on the part of the general a profound knowledge of the art,"* and he has expressly told us that "All war ought to be methodical, since all war should be conducted in conformity with the principles and the rules of the art and with reason, to have one object: it should be made in accordance with the forces one has."† The essential principles which must be observed are, as we have already seen, viz.:

1. To keep one's forces united;
2. Not to be vulnerable on any point;
3. To move with rapidity on important points; and
4. To give one's self every chance possible to assure victory on the battle-field by there uniting all one's forces.‡

These essential principles Napoleon applied to his own campaigns which are remarkable for five important characteristics, viz., 1. The initiative at the commencement of hostilities; 2. One line of operations; 3. The unity of forces; 4. The rapidity of movement on decisive points; and 5. The concentration before battle.

I. It is not our purpose to enter here upon an elaborate discussion of the relative merits of offensive or defensive operations. To make war is to attack, and the offensive at the beginning of operations offers the most favorable means for making a combined movement upon a decisive point with greatly superior forces.§ Tactically considered the defense may or may not be the more advantageous according to circumstances; strategically, the offense always has been, and probably always will be, the superior, since the defense must necessarily always await with uncertainty the development of the attack and subsequently conform to it.‖ Even as a means of defense, the

* Napoleon. "Événements des six derniers mois de 1799." Corresp. Vol. 30, p. 302.

† Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 418.

‡ *Vide supra*, p. 8.

§ Compare Jomini, "Treatise on Grand Military Operations." (Edition of 1865.) Vol. 2, pp. 367, 368, 449, and 455.

‖ Compare Hamley, p. 44. Von der Goltz, p. 24. Jomini, "Art of War" (1854), p. 83.

initiative is greatly preferable to a passive defense.* The principal inconveniences of the offensive lie in its ever-decreasing power, in the comparative difficulty of supply, and in the necessity of guarding a long line of communications when the invader has penetrated far into the enemy's country as did Napoleon in 1805, 1809, and especially in 1812.† These disadvantages are more than counterbalanced by the great advantages conferred by the initiative consistently and thoroughly pushed through to its full fruition.‡ Throughout his campaigns Napoleon always made it a rule to take the initiative, whether acting on the offensive or the defensive—an invariable characteristic of all great commanders.§ He however took great care never to neglect any means which might give him information as to the movements and intentions of his adversaries, and, moreover, prior to the commencement of hostilities, he always sent officers in disguise to reconnoitre with greatest care the theatre where he proposed to operate.‖ To his elaborate system of spies.¶ and to his careful reconnaissances, his ability to keep the initiative was, beyond doubt, largely indebted.

II. The second great principle of Napoleonic Strategy is that of *One Line of Operations.* "*An army should have only one line of operations.*" ** This important fundamental principle was strongly emphasized by the great strategist in whose campaigns it was most clearly examplified. Independent of the

* Hamley, p. 47. Jomini, *ibid.*, p. 84. "A deliberate defensive is generally right only when all the conditions are so unfavorable that practically there is no alternative." Hart. "Reflections on the Art of War," p. 127 and foot-note on p. 84.

† Hamley, pp. 46–47. "All offensive war is a war of invasion." Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 417.

‡ Hohenlohe-Ingelfingen, p. 101. 5th axiom of Strategy. "To change strategical plans when not forced to by circumstances leads to disaster."

§ "*Make offensive war like Alexander, Hannibal, Cæsar, Gustavus Adolphus, Turenne, Prince Eugene, and Frederick. Read, re-read the history of their eighty-three campaigns. Model yourself on them. It is the only way to become a great captain and to master the secrets of the art. Your genius thus enlightened will make you reject the maxims opposed to those of these great men.*"—Napoleon, "Notes sur l' Art de la Guerre." *Ibid.*, p 418.

‖ *Vide* Derrécagaix, Part I. pp. 167–171. Also article on "Jena=Mars-la-Tour—Vionville" in JOURNAL M. S. INSTITUTION, May, 1899.

¶ *Vide* Muller, "L'Espionage militaire sous Napoleon I."

** Napoleon. "Observations sur les campagnes de 1796 et 1797." 9th observation. Corresp. Vol. 29, p. 344.

proper selection of roads to be traversed by the different columns of an army, its truth has been recognized by military men in all ages.* The difficulty of ascertaining at the opening of hostilities the exact decisive point at which two or more lines of operation should converge, makes it almost impossible to obtain *that unity of action which is a sine qua non in war* and thereby invites the enemy to be the stronger at the decisive point and to defeat in detail the forces operating by different lines. "*To operate by distant directions and without communication*," Napoleon has told us, "*is an error which generally leads to the commission of a second. The detached column has orders for the first day only. Its operations for the second day depend upon what has happened to the principal column. It either loses time in awaiting orders, or it acts by hazard.*"† A cursory glance at the operations of Frederick the Great in 1756, of Würmser and Alvinzi, Moreau and Jourdan in 1796, the Allies in 1813, 1814 and 1815, and the Union armies in 1861 and 1862 will quite suffice to show the vicious principle of double lines of operation.‡

One of the great advantages conferred by a single line of operations is in the use of "*interior lines*," upon which Jomini has laid such stress,§ and which have been well defined as "the

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* Derrécagaix, Part I., p. 244.

The singleness of a line of operations has no reference to the smallness of the base. On the contrary, the larger the base the greater the advantage to be derived therefrom. The true meaning of this principle is that one must not debouch from the base except by a single zone nor operate but by a single line.

† Napoleon. *Ibid.* 3d observation. Corresp. Vol. 29, p. 331. In commenting upon the operations of Frederick in 1756, he said, "*This manner of invading a country by a double line of operations is faulty.*" "Précis des guerres de Frédéric II." 2d observation. Corresp. Vol. 32, p. 165.

‡ For the campaigns of 1796, 1814, 1815, 1861 and 1862, *vide* Hamley. Although through fortunate circumstances neither Frederick nor the Allies in 1813, 1814, and 1815 were beaten, their double line of operations were nevertheless faulty. The Allies in 1815 operated from divergent bases, but their lines of operation, although concentric, were nevertheless distinct and separate. The French Republican armies in 1792 and 1793 were also victorious in spite of double lines; but as Napoleon said, "there are two sorts of plans of campaign, the good and the bad. Sometimes the good ones fail through fortuitous circumstances; sometimes the bad ones succeed by a caprice of fortune." "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 417.

§ Jomini. "Grand Military Operations." Vol. 1, pp. 249–250.

communicating ways which most directly join the different parts of the theatre of operations."* "Single and interior lines have for their object to place in action, at the most important point and by means of strategic movements, a greater number of divisions and consequently a greater mass than the enemy.† An army whose lines are interior and nearer than those of the enemy can, by a strategic movement, overwhelm those of the enemy successively by concentrating upon his lines alternately the mass of its forces."‡ The principle of interior lines is, in reality, that of the closest communication between the fractions of the forces engaged in the theatre of operations, by which a commander is enable to preserve intact.

III. *The Unity of Forces*, the third and certainly one of the most characteristic principles of Napoleonic Strategy. Throughout his career in the field and in his subsequent writings the Emperor laid the greatest emphasis upon the absolute necessity of keeping one's forces united and in close inter-communication. His Correspondence teems with reiterated orders to his marshals and generals to assure, as often as possible, the touch between the juxtaposed corps. The unity of forces was for him a *sine qua non*, without which strategical and tactical advantages could neither be gained nor maintained except by mere chance.§ In this respect his system of Strategy was a marked innovation at the time and a notable contrast to the invariable and faulty system of dispersion which the military men preceding him had carried to such a remarkable extent. Napoleon was undoubtedly the greatest exponent of concentration, both strategical and tactical, of all times, and if he found it so uniformly and wonderfully effective, we can but accept his dictum

* Derrécagaix, p. 269.

† Jomini. *Ibid.*, Vol. 2, p. 39.

‡ Jomini. *Ibid.*, Vol. 2, p. 249. Of these lines the campaigns of 1796, 1797, and 1814 are perhaps the best examples. Their advantageous use is also evident in the manœuvres at Abensberg and Eckmühl in 1809. Their full value can, however, never be realized unless the general will (1) "always manœuvre offensively and in force," and (2) "take the offensive upon only one point at a time." Derrécagaix, p. 270 and A. G. "Maximes de Guerre de Napoleon I," pp. 136, *et seq.*

§ "The fundamental principle upon which every military combination rests is to operate with the greatest mass of our forces, *a combined effort, upon a decisive point.*" Jomini. *Ibid.*, Vol. 2, p. 448. The italics are ours.

as conclusive. "*The unity of command*," he was convinced, could only be attained by a close connection between the forces engaged in the same theatre of operations,* and, for this reason, he always preferred to operate with one large army rather than with two or more smaller armies.† It is true that his corps were often separated for subsistence, but the intercommunication was scrupulously preserved, and whenever they reached the presence of the enemy they were invariably "concentrated to strike."‡ The readiness for every eventuality which he considered such an important quality in every good general § can only be taken advantage of when troops are well in hand and not scattered over the theatre of war. The fundamental principles of the unity of forces, upon which he laid so much emphasis, was based upon the fact that it prevents one's own forces from being isolated and beaten in detail, and, conversely, it helps one to be ready for every eventuality and enables one to be superior to, and thereby to defeat in detail, all fractions of the hostile forces which may be encountered when separated from the principal army.‖ So thoroughly did the Napoleonic campaigns demonstrate the truth of this principle and the fatal effects of its violation in the presence of a skillful adversary that there is to-day scarcely a text-book on war in which it is not to be found as a maxim.

In discussing this fundamental principle of the unity of

* In the march to the Traun in 1805, after the capitulation of Mack at Ulm, Napoleon kept 100,000 on the one main chaussée on the south bank of the Danube rather than to march them by roads nearer the Tyrol, where the intercommunication would have been difficult.

† "There must be only one army, for the unity of command is the first necessity of war." Napoleon. "Notes sur l'Art de la Guerre." Corresp. Vol. 31, p. 418.

‡ "Genius in the art of war consists in knowing when to scatter your forces and when to unite them." Sargent. "Napoleon Bonaparte's First Campaign," p. 71—an admirable work.

§ A great captain ought to say to himself several times a day, "If the enemy's army should appear on my front, on my right, or on my left, what should I do? If he finds that he is embarrassed, he is badly posted, he is not correct. He ought to remedy it." Napoleon. "Observations sur les campaigns de 1796 et 1797." 5th observation. Corresp. Vol. 29, pp. 338–339.

‖ If there was one distinguishing peculiarity of Napoleon's system of war, it was that of so manœuvring as to divide the forces of the enemy and then to defeat them in detail." Sargent, "Campaign of Marengo," p. 131.

forces, Napoleon laid down the following important maxims, viz.: 1. "*Never separate the wings of your army, one from the other, in such a way that your enemy can place himself in the intervals.*"* Any failure to preserve this important rule of the unity of forces must necessarily destroy the intercommunication and the ability of the fractions to support each other and be a flagrant violation of "*the principle which wishes an army to be, every day and at every hour, ready to fight; * * * since, in order for an army to be ready to fight, it must be united.*" † "It is, therefore, a principle that *an army ought always to keep all its columns united in such a way that the enemy cannot introduce himself between them.* When, for any reasons whatsoever, one diverts from this principle, the detached corps must be independent in their operations, and direct themselves, in order to re-unite, on a fixed point toward which they are marching without hesitation and without new orders, so that they should be less exposed to attack while isolated."‡

No other general has ever made such extensive turning movements as did Napoleon § who has told us, "*Do not attack in front positions which you can obtain by turning them.*"‖ In great turning movements, it is evident that the intercommunication and unity of forces are much more difficult to preserve than in direct attacks, and the cardinal rule to be observed is found in the maxim

2. "*The art of war indicates that a wing must be turned or outflanked without separating the army.*"¶

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* Napoleon. "Précis des guerres de Frédéric II." 11th observation. Corresp. Vol. 32. p. 196. The same maxim he likewise applied to tactics, when he charged us, "*Do not put between the different corps of your line of battle a single interval where the enemy can penetrate.*" "Quelque considérations sur la guerre de Sept Ans." *Ibid.*, p. 243.

† Napoleon. "Campagnes d'Italie de 1796 et 1797." 5th observation. Corresp. Vol. 29, pp. 336-337. Compare Hamley, p. 152.

‡ Napoleon. "Observations sur les campagnes de 1796 et 1797." 23d observation. *Ibid.*, p. 331. Compare p. 13. *Vide* direction of march and point of reunion given to Vaubois in the campaign of 1796, *infra*, p. 40.

§ The campaigns of 1800, 1805 and 1806 were all great turning movements in which the fundamental idea was identical, but the execution modified by circumstances.

‖ Napoleon. "Précis des guerres du Maréchal Turenne." 18th observation. Corresp. Vol. 32, p. 133.

¶ Napoleon. "Précis des guerres de Frédéric II." 23d observation. Corresp.

A not less important rule, and one on which the Emperor laid the greatest stress, is found in maxim

3. It is "*a principle which admits of no exception that all junctions of army corps should be made in the rear and far from the enemy.*"* This principle is reiterated in Napoleon's Commentaries with great force as an important part of the fundamental rule of the unity of forces.† The junctions of fractions of an army in the presence of an enemy invites their defeat in detail before they can be re-united and in such cases "*it would be better to make three or four marches more and to unite one's columns in the rear and far from the enemy than to operate their reunion in his presence.*"‡ A violation of the principle that an army should have only one line of operations will often cause an infraction of this maxim as is shown by the operations of Würmser, Alvinzi,§ Moreau and Jourdan in 1796, Moreau and Macdonald in 1799, the Allies in 1805, 1813, 1814 and 1815. Napoleon, however, throughout his career never employed but one line of operations‖ and always preserved with scrupulous care the unity of his forces.¶

IV. The fourth great feature of Napoleonic Strategy is *the Rapidity of Movement.*—It was he who, perhaps, first fully realized that the mobility of an army is the essential condition for

Vol. 32, p. 221. Excellent examples of the truth of this maxim will be found in the operations of Kolin (1757), Crevelt (1758), Maxen (1759), Liegnitz and Torgau (1760), Rivoli (1797), Kulm and Bautzen (1813), and Laon (1814). *Vide* also the writer's article on "Oblique Attack" in JOURNAL OF THE MIL. SERVICE INST. for March, 1889.

* Napoleon. "Précis des événements des six derniers mois de 1799." 5th observation. Corresp. Vol. 30, p. 298. The soundness of this principle is demonstrated by the operations of Moreau and Macdonald in 1799, Frederick in 1757, Turenne in 1636 and 1648, and the Allies in 1815.

† This same maxim is found slightly differently worded in the "Précis des guerres de Frédéric II." 4th observation. *Ibid.*, p. 172. Applied to cantonments. Napoleon said ("Précis des guerres du Maréchal Turenne." 4th observation. Corresp. Vol. 32, p. 98), apropos of the battle of Marienthal: "*It is one of the most important principles of war, which one rarely violates with impunity: To assemble one's cantonments on the point the most distant and sheltered from the enemy.*"

‡ Napoleon. "Précis des événements des six derniers mois de 1799." Corresp. Vol. 30, p. 289.

§ *Vide infra*, pp. 35–47.

‖ Jomini. "Grand Military Operations." Vol. 2, p. 11.

¶ The campaign of 1813 is perhaps the most notable exception. Its disastrous results for the French Emperor are well known.

its success. Contrasted with the elephantine movements of his immediate predecessors, which were due largely to a blind following of pedantic rules, his manœuvres were like those of an agile tiger which attacks on every side. "*The strength of an army*," he declared, "*like the power in mechanics, is computed by the product of the mass by the rapidity. This march far from weakening the army augments its morale. It increases its chances of victory.*"* The most brilliant strategical plan is useless unless it is put into active operation before the enemy has had time to comprehend and to reply to it by the correct manœuvre.† It is equally futile to mass troops without imparting some direction and energy to them. Moreover, it is of no avail to discern that the enemy has made a mistake or by a faulty movement laid himself open to defeat unless one will be quick to seize the opportunity thus offered and by rapidity of movement upon the decisive point, punish him for his blunder.‡ Rapidity of movement is not merely the only way of reaping the full advantage of taking the initiative, but *it is the natural and necessary complement of the unity of forces.* This great truth was first demonstrated in a most conclusive manner by Napoleon's earlier campaigns, and it is the union of these two great principles which is the distinguishing feature of Napoleonic Strategy. Whether employed to produce strategical ruptures or in great turning movements, whether used in the theatre of operations or on the field of battle, its truth is equally evident. "*The greatest secret of war consists in becoming master of the communications of the enemy.*"§ But the accomplishment of such an important object is almost impossible without rapidity of movement by united forces. In all Napoleon's many campaigns the predominating rule is the invariable use of these two great principles employed together against the decisive points which he

* Napoleon. "Observations sur les campagnes de 1796 et 1797." 2d observation. Corresp. Vol. 29, pp. 327–328.

† Compare Von der Goltz. p. 34. "Rapidity of movement and surprise are thus the life and soul of strategical offensive."

‡ Compare Jomini, "Grand Military Operations." Vol. 2, p. 453. "It is not sufficient to bring about a good operation in war, to bring our masses skillfully to bear upon the most important point. It is necessary to know how to engage them there."

§ Jomini *Ibid.*. Vol. 2, p. 59, quoting a remark made to him by Napoleon at the beginning of the campaign of Jena.

knew so well how to select.* In the annals of war there are few, if any, campaigns in which such decisive results have been gained as in Napoleon's campaigns of 1796, 1797, 1800, 1805, and 1806, all of which were won by the unity of forces, rapidity of movement, and a single line of operations so chosen as to sever the enemy's communications.†

V. The fifth important characteristic of Napoleonic Strategy is *the invariable concentration just before every battle*, and never has any other commander carried to greater extreme the massing of troops for a decisive action than did the great Napoleon. The full advantage of the most ably-conceived strategical plan can seldom be obtained without a successful and decisive battle to complete the dispersion and destruction of the hostile forces.‡ So impossible it is, as a rule, to foresee the exact points at which decisive collisions will occur that the only way to assure superiority is to outnumber the enemy.§

"*One can never be too strong for a decisive battle*," ‖ and this idea was for Napoleon the whole art of war and secret of success.¶

On this subject the Emperor has laid down the following important rules, viz. :—

1. "*The first principle of war is that one ought not to deliver battle except with all the troops which one can unite on the field of operations.*"**

2. "*General rule : When you wish to fight a battle, assemble*

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* "It is a fundamental rule in war to know how to sacrifice secondary to primary points."—A. G. "Maxims de Guerre de Napoléon I.," p. 98.

† "According to Napoleon and the Archduke Charles, the most advantageous direction of the lines of operation is that which *permits an army to threaten the communications of the enemy without compromising its own.*" Derrécagaix, Part I., pp. 230–231.

‡ Compare Hamley, p. 59. "All operations must ultimately rely for success upon power of fighting ; for it is of no avail to conduct an army into situations which it cannot maintain in battle."

§ Compare Von der Goltz, pp. 10–11.

‖ Hohenlohe-Ingelfingen, p. 101. 3d axiom of strategy.

"A battle sometimes decides everything." Napoleon quoted in O'Meara. Vol. I., p. 193.

¶ *Vide supra*, p. 1.

** Napoleon. "Précis des guerres de Frédéric II." 24th observation. Corresp. Vol. 32, p. 227.

your forces. Do not neglect a single one; a battalion sometimes decides the day." *

3. "*It is a principle that one should never make any detachment on the eve of a battle, because, in the night the state of things may change, either through movements of retreat by the enemy or through the arrival of large reinforcements, which enable him to take the offensive and to render fatal the premature dispositions which you have made.*" †

4. "*Never do what the enemy wishes for the simple reason that he does wish it. Avoid the field of battle which he has studied, reconnoitred, and, with even more care that which he has fortified or where he has entrenched.*" ‡

The fact that during all his long and marvellous career Napoleon seldom fought a battle in which he was numerically inferior to the forces of his adversaries, and never lost one in which he was superior is conclusive evidence of the soundness of his principle of concentration. In fine, as the Emperor declared, "*One must keep the army united, concentrate the greatest forces possible on the field of battle, profit by every occasion, for Fortune is a woman; if you miss her to-day, do not expect to find her again to-morrow.*" §

Throughout these above-enumerated principles runs the fundamental idea of simplicity. No one has ever realized more thoroughly the enormous difficulties and perplexities which must necessarily beset the operations of every general than did Napoleon. Every military man has learned through experience how extremely difficult it is to execute the least compli-

* *Ibid.*, 17th observation, p. 210. Although in the campaign of Waterloo Grouchy undoubtedly disobeyed orders, Napoleon's failure to rally him to him probably cost him the battle. Had the Prussians failed to arrive at Waterloo and had Wellington lost the battle, he would have bitterly felt the consequences of his violation of this maxim in leaving so large a detachment at Hall.

† Napoleon. "Observations sur les campagnes de 1796 et 1797." 5th observation. Corresp. Vol. 29, p. 338. The First Consul violated this maxim when, on June 13, 1800, he detached Desaix's division. It is true that he was ignorant of Melas' intentions, but it was only the good judgment and timely arrival of Desaix at Marengo which saved the battle from consequences very disastrous to the French.

‡ Napoleon. "Précis des guerres du Maréchal Turenne." 18th observation. Corresp. Vol. 32, p. 133.

§ *Ibid.* "Notes sur l'Art de la Guerre." 40th conclusion. Corresp. Vol. 31, p. 418.

cated manœuvre, even under the most favorable conditions. With large forces and in the actual theatre of war the difficulties increase in such a proportion as to make intricate movements almost impossible. Napoleon has himself told us that "*The art of war is a simple art and entirely one of execution. There is nothing vague. Everything in it is good sense; nothing in it is ideal.*" * In the characteristics of his strategy, which we have already examined, is not the fundamental idea that of simplicity? The initiative is the simplest way to force an adversary to conform to one's own attack; one line of operations is the simplest manner of bringing to the decisive point a stronger force than the enemy; the unity of forces is the simplest way to assure one's own unity of action, to be always ready to fight, and to be numerically superior to the enemy in the event of an encounter; rapidity of movement is the simplest manner of surprising and outmanœuvring the hostile forces; and concentration before a battle is the simplest way to assure one's own superiority by outnumbering the enemy at the time and place of actual and decisive conflict. Efficiency in war, as in everything else, consists in obtaining the maximum amount of effect with the minimum amount of effort for which the *sine qua non* is simplicity. "*As war is an art of execution, all complicated combinations should be discarded. Simplicity is the first condition of all good manœuvres.*" †

In the brief review which we shall make of the two most masterful campaigns of this greatest of all strategists, viz., those of 1796 and 1797, we purpose to consider them with especial reference to the five great characteristics already enumerated, *i. e.*, the initiative, the singleness of the line of operations, the unity of forces, the rapidity of movement, and the invariable concentration for battle.

THE CAMPAIGN OF 1796. FIRST STAGE.

The command of the French "Army of Italy" extending along the Apennines between Nice and Genoa, was given by the Directory, in March, 1796, to General Napoleon Bonaparte with instructions that "the most immediate interest of the

* Napoleon. "Précis des événements des six premiers mois de 1799." 1st observation. Corresp. Vol. 30, p. 263.

† Napoleon. Précis des événements des six derniers mois de 1799. 1st observation. *Ibid.*, p. 289.

French Government should be to direct its principal efforts against the armies and territories of the Austrians in Lombardy." * Bonaparte's army, consisting of about 42,000 half-starved and ill-clad men, held the passes of the Col di Tenda, Ormea, San Giacomo, Cadilona, and Savona, with an advance brigade at Voltri, and its operations were to be further seconded by a force of 20,000 men, under General Kellermann, which was to cross the French Alps by the pass of Mont Cenis. The French line of communications was by the Corniche road from Savona through Nice to France. Opposed to Bonaparte was the Allied army, under the octogenarian Beaulieu, consisting of 20,000 Sardinians and 30,000 Austrians, the former extending from Coni through Ceva (headquarters) to Millesimo, and the latter from Sassello through Ovada to Voltaggio (headquarters) with whom Beaulieu was to be found. The base of the Sardinians was Turin, and the base of the Austrians, the river Mincio. The object of Bonaparte was to separate the Sardinians from the Austrians, who concerned themselves but little about their allies, and to make peace with the former, so as to gain a safe base for farther operations against the Austrians whose sole object was to cover Lombardy.† The French army was necessarily greatly extended, but the divisions were, however, assembled at the points mentioned and in good inter-communication. The Allies were also extended over a front of 70 miles, but the nature of the ground was such that their forces were much more disseminated, since "the Austrians, pursuing the system common at the time, sought to guard all the avenues by occupying all; and thus their forces were greatly subdivided and separated from each other by the intervening ridges, while the French had the Nice-Genoa road (the Corniche) by which to communicate." ‡

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* Quoted by Hamley, p. 142.

† "It is easy to perceive that every movement against the Piedmontese or their territory is in some way indifferent to the Austrians, who, as was shown in the last campaign, trouble themselves very little about the disasters of their allies, and who in moments of danger, far from seeking to protect them effectually, separate themselves at once from them and occupy themselves merely with covering the country which belongs to them, and which furnishes them abundantly with the resources of which they are in need."—Instructions given by the Directory to General Bonaparte.

‡ Hamley, p. 139.

On April 10th both armies assumed the offensive.* Beaulieu, deceived by the presence of Cervoni at Voltri, expected to be turned by his left. He accordingly directed all his force against the Corniche between Genoa and Savona, but while Cervoni contained and retarded his advance, Bonaparte had united his forces † and had defeated Argenteau, on the 12th, at Montenotte, and the Sardinians on the 13th, driving the former back on Dego and the latter on Ceva. A strategical rupture had been made, and the Allied centre was pierced on the 13th. On the following day, Massena and La Harpe attacked the Austrians at Dego, where Beaulieu had ordered all his forces to concentrate, and forced them to continue their retreat down the Bormida. "It was always a characteristic of Napoleon to direct his troops where their action would be most effective," ‡ and, on the 15th, he decided to crush the Sardinians who had been concentrated by General Colli in the entrenched camp at Ceva. This same day La Harpe and Massena defeated four Austrian battalions directed by Beaulieu on Dego, and the divisions of Augereau and Serrurier were concentrated in close inter-communication § on the principal spurs of the Apennines between Ceva and Millesimo. La Harpe was directed on San Benedetto to prevent any attack upon Bonaparte's rear, or to anticipate any attempt to rejoin the Sardinians which might be made by the Austrians then concentrating at Acqui. A brigade was also left at Cairo to protect his communications.‖ Massena, Augegerau, and Serrurier were directed on Ceva ¶ from which Colli was driven on the 17th and forced to retire to the position, Lesegno–St. Michele–Vico before Mondovi. On the 19th, Bonaparte attacked him but was repulsed; nevertheless, in spite of the fatigue and discouragement of his troops, it was decided in

* The initiative was, in this case, taken simultaneously.

† Note the union of the French divisions which was made in the rear of the army and not in the presence of the enemy. *Vide* maxim on p. 19.

‡ Hamley, p. 143.

§ Note the careful observance of the maxim "Never separate the wings of your army, one from the other, in such a way that your enemy can place himself in the intervals." *Vide* p. 17.

‖ "Preserve with care and never abandon with a light heart your line of operations." Napoleon "Quelques considerations sur la guerre de Sept Ans. II." 2 Corresp., Vol. 32, p. 240.

¶ The invariable concentration for battle.

a council of war held on the 20th, to make a second attack before the enemy could recover.* On the 22d, the French attacked the Sardinians, who had retrograded to Mondovi, and driving them from their position, forced Colli to retreat to Fossano. Bonaparte then changed his line of operations, and his communications with Nice to the line Ceva-Ormea,† and notwithstanding the overtures for peace made by Colli on the 23d and the consequent *pour parlers*, continued to advance. On the 24th, Beaulieu moved from Acqui through Nizza, *en route* to Alba, from which he hoped to rejoin Colli, but he was anticipated at Alba on the 25th by Augereau, while the Sardinians in full retreat on Turin had this day reached Carignano. The entire French army was concentrated on the following day at Alba, ready, if necessary, to fight Beaulieu, and Bonaparte opened communications with Nice by Fossano, Coni, and the Col di Tenda. The Sardinian army was now interposed between Kellermann at Mont Cenis and the Army of Italy on the Tanaro, and it was to prevent operations against the French analogous to those which he had just so successfully employed against the Allies, that Bonaparte, before his departure from Fossano on the morning of the 25th, sent urgent messages to the commander of Kellermann's right to issue from the Alps toward him.‡ Beaulieu finding his advance barred at Alba, had meanwhile retreated, and the French accordingly continued their movement on Turin in pursuit of the Sardinians,§ but, on the 28th, Victor Amadeus III. signed an armistice at Cherasco

* "It is not enough to pierce and divide the enemy's army; the advantage thus gained must be promptly followed up, or a subsequent reunion of the parts may nullify all the previous operations. * * * That is to say, the first stroke must be followed up by successive blows on one or both sides, which shall at once keep the enemy asunder, and destroy his force." Hamley, p. 144.

† "*He does not violate a second principle not less sacred, that of not abandoning his line of operations, but he changes it, which is considered as the ablest manœuvre taught by the art of war.*" Napoleon "Précis des guerres de Frédéric II." 10th observation. Corresp. Vol. 32, p. 184.

‡ The Sardinians not only lacked the military foresight to seize such an opportunity, but even if they had, it is doubtful whether they could have operated successfully; (1) because they would have been inferior in forces to either army, and (2) because the distance from Mont Cenis to Turin is so short that Kellermann, unless vigorously opposed, could have reached their capital in one march, and by seizing it surround their armies. *Vide* Hamley, p. 145.

§ The rapidity of Bonaparte's movements is too evident to require comment.

which brought to a close the brief first stage of this remarkable campaign. By the terms of the treaty of peace the Sardinian king was detached from his allies, and not only surrendered to the French the frontier fortresses of Coni, Tortona, and Ceva, but granted them the line of Mont Cenis for their communications with France, in subsequent operations against the Austrians in Lombardy, as well as permission to cross the Po at Valenza.*

SECOND STAGE.

On the 30th of April Bonaparte set his army in motion toward Alessandria. Beaulieu, deceived into believing that he would attempt to cross the Po at Valenza, had massed his troops—which had then been reinforced to 42,000 men† and 120 guns—on the Ticino and had occupied Valeggio, Pavia, and Mantua. On May 5th the Frenth took the offensive. Bonaparte with his advance guard, composed of all his cavalry, 3500 grenadiers, and 24 guns, marched rapidly from Alessandria down the Po to Piacenza where he forced a crossing on the 7th, and completely deceiving Beaulieu, turned the Ticino.‡ The lack of a pontoon train considerably delayed his divisions, but he promptly attacked Liptai at Fombio on the 8th and drove him back on Lodi where Beaulieu had posted his rear-guard, 12,000 strong, to cover his retreat to Brescia. On the 9th, however, Beaulieu took the offensive and that night attacked the 1st division, but, although La Harpe was killed, the French ultimately compelled them to retire. On the 10th, after a desperate fight at Lodi, the French, led by Bonaparte in person, forced the passage of the Adda and hastened Beaulieu's retreat to the Mincio.§

* A ruse of the French generals to deceive Beaulieu as to his real point for crossing that river in subsequent operations.

† Of these 42,000 troops, 12,000 were left in Mantua to guard the Austrian communications.

‡ *In 36 hours Bonaparte marched 40 miles*, followed by his divisions in echelon, the leading division farthest from the river—a wise precaution for a flank march made with even such remarkable rapidity.

§ "Napoleon on his nightly round encountered a bivouac of prisoners where there was an old garrulous Hungarian officer. He asked him how their affairs were progressing. The old captain could not deny that they were going very badly. 'But,' he added, 'there is no longer any way of understanding it. We have an affair with a young general who is now before us, now in our rear, now on our flanks. One never knows how one should place one's self. This manner of making war is insufferable and violates all custom.'" Napoleon. "Campagnes d'Italie." Corresp. 29, p. 102.

Leaving Serrurier at Cremona—to observe the troops in Mantua—and Augereau at Pavia, Bonaparte, on May 15th, made a triumphal entry into Milan, whose citadel, occupied by 2000 Austrians, was at once invested. A few days only were spent in Milan to force the Italian princes to sue for peace, and, on the 28th, he moved his entire army through Brescia against Beaulieu, who had meanwhile occupied the line of the Mincio from the Lago di Garda to Mantua. To conceal his real intention, the French general made a demonstration against Peschiera, and, on the 29th, hurled all his available forces against Valeggio, forced the Mincio, and pierced the Austrian centre. Beaulieu was compelled to retreat into the Tyrol to Roveredo, and to abandon not only Peschiera, which was immediately occupied, but Mantua in which he had left 12,000 troops.

The first Austrian army was now hors-de-combat, and Bonaparte promptly directed his energies elsewhere. He descended the Adige and occupied Verona and Legnago, appanages of Venice, in order to compel that republic to ally itself with France. On June 4th, the investment of Mantua was begun, for which Serrurier was given 15,000 men. To support him 5000 more were left on the Adige, and Bonaparte then marched southward against the States of the Church in order to force the Pope into an alliance. Modena, the Legations of Bologna and Ferrara, Genoa, Leghorn, and Florence were occupied in turn and heavy contributions, with the result that on June 24th, Pius VI. concluded an armistice at Foligno, and the second stage of this campaign came to a close, leaving Bonaparte master *ad interim* of all Italy except the fortress of Mantua and its beleaguered garrison.

THIRD STAGE.

The Austrian monarchy had no idea of relinquishing its valuable Italian possessions after merely one disastrous campaign and determined to make a vigorous attempt to relieve Mantua and to recover Lombardy. The defeated army, reinforced by 30,000 picked men from the Rhine, was reorganized by General Melas, and Beaulieu was superseded in command by Marshal Würmser. The army at Trent now numbered 60,000, exclusive of the 12,000 blockaded in Mantua, opposed to which Bonaparte had scarcely 45,000 men, of which 15,000

were engaged in investing Mantua and 10,000 in keeping open his communications.

During the last week of July, Würmser began his advance southward. Quasdanovich, with 25,000 men, was sent down the west side of the Lago di Garda to seize the French communications simultaneously with the attack of his own force of 35,000 on Verona by the eastern side of the lake—a plan by which Würmser expected to envelop and capture the entire French army.* Bonaparte had meanwhile posted Massena with 15,000 men at Rivoli, Despinoy with 5000 at Verona, Augereau with 8000 at Legnago, and Sauret with 4000 at Salo, but "not being strong enough to take the offensive, had no plan."† On the 29th, Massena was driven back from Rivoli by Würmser and Sauret from Salo by Quasdanovich moving on Brescia—facts which Bonaparte learned on the 30th. In a council of war held that day all his generals, except Augereau, advised retreat, but Bonaparte, recognizing the blunder made by his adversaries,‡ decided to fight and at once ordered Serrurier to raise the siege of Mantua and to rejoin him, while all his other divisions were ordered to concentrate near Peschiera which they did on the following day. On August 1st he left Massena on the Mincio to observe and contain Würmser and moved to the Chusa, driving Quasdanovich out of Brescia. Würmser, however, succeeded in evading Massena and in crossing the Mincio, and sent a division on Lonato and another on Castiglione but continued his march with the bulk of his army on Mantua.§ On the 2d he relieved the fortress and re-provisioned the 12,000

* "It was a mistake to make the corps which had not a single communication with each other, *operate separately*, against an army centralized and whose communications were easy." Napoleon's comments on Würmser's operations in his "Campagnes d'Italie," Corresp. Vol. 29, p. 137.

† Sargent, p. 48. His numerical inferiority forced Bonaparte to remain on the defensive and his plan was therefore necessarily postponed until the Austrian attack had developed. Compare *supra*, p. 9, foot-note 3.

‡ "To operate by distant directions and without communications is an error which ordinarily causes the commission of a second," etc. (*Vide* p. 13). "It is therefore a principle that an army ought always to keep its columns united in such a way that the enemy cannot introduce himself between them." (*Vide* p. 18.) Napoleon's comments on Würmser's mistakes. "Observations des campagnes de 1796 et 1797." 3d observation. Corresp. Vol. 29, p. 331.

§ "The plan of Würmser at the beginning of August was defective." Napoleon. *Ibid.*, p. 331.

men there blockaded and marched for Castiglione, but, meanwhile, Bonaparte, rejoined by Serrurier, had concentrated his forces at Lonato to which Massena retrograded and directed Augereau on Castiglione. On the 3d, Augereau contained and succeeded in driving back Würmser at Castiglione, while Bonaparte who had assembled over 25,000 troops at Lonato, pierced Quasdanovich's centre and forced him to retreat in great disorder on Riva.* Quasdanovich was now disposed of, and Bonaparte again concentrated his army with such wonderful rapidity that on August 5th, at the second battle of Castiglione, his forces were but little inferior in numbers to Würmser. While Massena and Augereau attacked in front, Serrurier turned the Austrian flank and fell upon his rear † with the result that Würmser was badly defeated and compelled to retreat across the Mincio. Routed again on the 6th at Peschiera the Austrians fled into the Tyrol to their former position at Roveredo.

The French army was again established on the Adige and Mantua was reinvested after this brief and remarkable campaign. "*In six days Bonaparte had captured, killed or wounded nearly twenty thousand Austrians, and lost but seven thousand French. In six days he had fought and won three pitched battles, had almost annihilated Würmser's army, and had for the second time driven the Austrians out of Italy.*" ‡

For the next three weeks both armies remained inactive and both were reinforced. In the beginning of September, Würmser again began his advance southward. Notwithstanding the salutary lesson he had just received, he persisted in again dividing his forces, leaving the division of Davidovich, composed of 20,000 men, scattered in detachments through the Tyrol, while he descended the valley of the Brenta with 26,000 men. His plan was to cross the Adige between Verona and Legnago, to relieve Mantua, and in case the French should advance into the Tyrol,

* By his skill in manœuvring Bonaparte actually outnumbered Quasdanovich.

† "The art of war indicates that a wing must be turned or outflanked without separating the army." *Vide supra*, p. 19.

‡ Sargent. "Napoleon Bonaparte's First Campaign," p. 51. The reader will note the masterful way in which Bonaparte employed "interior lines." The rules laid down on page 29, foot-note 3, should be borne in mind in considering these movements.

to sever their line of retreat, while Davidovich should attack them in front in the defiles of the Adige.

Meanwhile Bonaparte had been reinforced to 42,000 men by a detachment from Kellermann's army and had also taken the offensive, his purpose being to drive the Austrians from the Tyrol and to effect a junction with the armies of Moreau and Jourdan, who were fighting the Archduke Charles on the upper Danube. Leaving garrisons at Verona and Legnago and Sahnguet to continue the siege of Mantua, he directed Vaubois up the west shore of the Lago di Garda through Riva on Roveredo, * for which place Bonaparte marched by the eastern side, with the divisions of Massena and Augereau, in total ignorance of Würmser's movement. On August 31st he united these three divisions, † and, on September 4th, attacked and defeated Davidovich at Roveredo and Caliano, and driving him into the Tyrol, seized Trent on the 5th. Here Bonaparte was first informed that Würmser had advanced down the Brenta. It was one of those situations in which fortune favors genius rather than mediocrity. Würmser had involuntarily produced a strategic rupture between his army and that of Davidovich, into which the French general had unconsciously penetrated. Far from threatening the French rear, the French communications with Turin were secured by the possession of Roveredo and Riva, while the occupation of Trent enabled Bonaparte to debouch through the valley of the Brenta directly upon Würmser's rear. Finding himself unexpectedly in a most favorable position and with one of his enemies routed, Bonaparte renounced his original plan of uniting with the Army of the Rhine, and with splendid audacity determined to follow and crush Würmser before he could reach Mantua.‡ Leaving Vau-

* Vaubois had been stationed at Salo to prevent the Austrians in the Tyrol from seizing the French communications by the west side of the lake. His advance through Riva to Roveredo secured them on that side, but it may seem that it gave the Austrians the opportunity to crush in detail the French forces just as Bonaparte had done with Quasdanovich and Würmser. In case of attack Vaubois was to rejoin Bonaparte by the southern end of the lake, which would have prevented such an operation.

† Notice the careful observance of the principle that "all junctions of army corps should be made in the rear and far from the enemy." (*Vide supra*, p. 19.)

‡ "True wisdom for a general is in an energetic determination." Napoleon. "Précis des guerres de Frédéric II." 16th observation. Corresp. Vol. 32, p. 209.

bois to observe and contain Davidovich, he hastened with Augereau and Massena through the Brenta Pass and *marching 50 miles in two days*, attacked the Austrian rear-guard at Primolano on the 7th, and captured more than 4000 men. The advance guard was this day engaged with the French garrison at Verona, and Würmser was utterly astonished and dismayed to find Bonaparte in his rear. He at once recalled and assembled the bulk of his forces, and, on September 8th, he fought the battle of Bassano, in which Quasdanovich's division was separated from him, annihilated, and forced to retreat with barely 3000 men to Friuli.* Würmser, with 12,000 men, then made a dash for Mantua, and a race for that fortress ensued. Bonaparte directed Massena to cross the Adige at Ronco and Augereau to move through Padua and Legnago, and ordered Sahnguet at Mantua to destroy all the bridges about that town. Würmser halted one day at Legnago, where he left a garrison of 2000 men, and this delay would have been fatal to him, but Massena had unfortunately no pontoon train for a prompt crossing of the Adige and Sahnguet did not receive the order until late, and was so unnecessarily slow that Würmser, notwithstanding his several hard night marches, succeeded in entering Mantua on the 14th.

In the meantime, Augereau and Massena had captured the Austrian garrison left at Legnago on the 13th and Bonaparte had again concentrated his 3 divisions. On the 15th he once more defeated Würmser, who had advanced with the garrison of Mantua to meet him at San Georgio. The Austrians were driven within the walls, and, for the third time, the place was invested. *In less than a fortnight the third Austrian had been annihilated and hopelessly dispersed. Of a fourth army of 46,000 men, a part was in the Tyrol, another part in Friuli, 15,000 had been killed, wounded or captured, and the Commander-in-chief, with one-fourth of his forces, was blockaded in Mantua*, while Bonaparte's army was concentrated after losing only 7500 men.†

* In this battle Bonaparte had, as usual, by his skill in manœuvring assembled more forces than the Austrians. The French numbered 22,000 and the Austrians 20,000.

† Napoleon. "Campagnes d'Italie." Corresp. Vol. 29, p. 148.

FOURTH STAGE.

After the defeat of the third Austrian army Bonaparte occupied himself with the reconstitution of northern Italy and the erection of the Lombard Republic, but before the deliberations of the Assembly of Deputies had concluded, another Austrian army had taken the field. The Court of Vienna, surprised and disgusted, prepared for a desperate effort to regain its possessions and its prestige. The Emperor Francis II. appealed directly to the patriotism of his people, and a new and enthusiastic army was equipped under the command of General Alvinzi. The prospect for the Austrians was decidedly favorable. Davidovich with 20,000 men was in the Tyrol. Alvinzi with Quasdanovich's corps of 30,000 in Friuli, and Würmser with 20,000 men besieged at Mantua, a total of 70,000, opposed to which Bonaparte had scarcely 40,000 men, of which 8000 under Kilmaine were besieging Mantua, 10,000 under Massena were at Bassano observing Alvinzi, 9000 under Augereau at Verona, 10,000 under Vaubois near Trent, and about 2000 cavalry in reserve.

Alvinzi's plan was that Davidovich should drive Vaubois from the Lavis and that Quasdanovich should defeat Massena at Bassano by reason of their respective numerical superiority, both advancing on Verona, the former down the Adige and the latter from Bassano, whence with all his forces united Alvinzi purposed to relieve Mantua.* Bonaparte's plan was to repeat the same manœuvre which he had just so successfully used against Würmser, but reversing the side on which the attack should be made. "In other words, while Vaubois was holding Davidovich in check, Bonaparte intended to attack Alvinzi in force at or near Bassano and defeat him if possible; then to ascend the Brenta and unite with Vaubois for a combined attack against Davidovich.†

On November 1st, the Austrian advance began. Vaubois fell back toward Rivoli and Massena toward Verona.‡ Bona-

* "Nothing is more faulty than this plan." Napoleon's comment on Alvinzi. "Observations sur les campagnes de 1796 et 1797." Corresp. Vol. 29, p. 336.

† Sargent, p. 78.

‡ These manœuvres enabled Alvinzi to communicate with Davidovich along the valley of the Brenta by the road Bassano-Trent, but he strangely neglected

parte then directed Vaubois to check Davidovich's movement, and, by the 5th, had himself concentrated Massena and Augereau's divisions to resist Alvinzi whom he attacked on the 6th at the Brenta near Vincenza with only partial success. The information that Vaubois was hard pressed forced him, however, to abandon the attack planned for the following day and to retire to Verona, where he learned that Vaubois, after losing one-third of his forces, had been forced back from Trent to Corona. Thither Bonaparte hurried with a few hastily collected battalions to restore by his presence their morale and to check Davidovich, and then as hurriedly returned to Verona, but during his absence Alvinzi had advanced on the 9th to Caldiero and had there taken up a very strong position. On the 12th the French attacked in a severe rain storm but were repulsed with considerable loss.

Bonaparte's situation was now extremely critical,* since the two Austrian armies had nearly succeeded in effecting their junction. For two days both armies remained inactive and Bonaparte prepared a master-stroke of audacity. On the night of the 14th he evacuated Verona, crossed the Adige with about 20,000 men and, marching down the right bank to Ronco, recrossed the river and reached the Alpon in the early morning of the 15th to turn Alvinzi's left flank. At Arcola† a division of Croats was encountered and a severe fight followed which caused Alvinzi to change front to the Alpon. For three successive days both armies fought most desperately for the possession of the causeways over the marshes, but it was not until the 17th that Bonaparte, who had given his soldiers an example of extraordinary personal bravery, succeeded, by means of a strategem, in gaining this remarkable battle of Arcola and in forcing Alvinzi to retreat to Vincenza and Bassano.

Meanwhile Davidovich had defeated Vaubois at Rivoli and

this great opportunity and continued to operate by separate lines. "He should have, as soon as he was master of Bassano and Davidovich of Trente, made him come by the gorges of the Brenta on Bassano, leaving the Tyrolese militia on Trente, and have presented himself on the Adige with all his army united." Napoleon. "Observations sur les campagnes de 1796 et 1797." 5th observation. Corresp. Vol. 29, p. 336.

* Napoleon. "Campagnes de Italie." Corresp. Vol. 29, p. 154.

† "The country between Arcola and the Adige had not been guarded at all." *Ibid.*, p. 158.

had compelled him to retrograde toward Verona. In spite of the fatigue of his own soldiers, Bonaparte sent his cavalry to pursue Alvinzi and himself turned with characteristic rapidity back to Verona where he united with Vaubois, attacked Davidovich at Rivoli on the 19th and drove him back into the Tyrol.* During this time Alvinzi had ascertained that he was pursued by cavalry only and had renewed his advance on Verona, but, upon learning of Davidovich's defeat, resumed his retreat behind the Brenta.

Although Alvinzi's forces had outnumbered the French in the proportion of 7 to 4, and although he had several times had victory within his grasp, he failed utterly to seize these advantages. *In three weeks Bonaparte by keeping his forces carefully united, by the rapidity of his movements, and by concentrating before every battle had outmanœuvred, defeated and dispersed the fourth Austrian army and had moreover kept Würmser shut up in Mantua an idle spectator of events.*† The desperate fighting had caused heavy losses amounting to about 13,000 men on each side. Although victorious Bonaparte was sadly in need of reinforcements and "the army stood more than ever in need of rest."‡ He therefore made overtures for peace which resulted in an armistice and a suspension of hostilities until January, 1797, and brought to a close *this marvellous campaign in which Bonaparte had invaded a territory at first hostile and, notwithstanding his continual inferiority of forces,§ had routed in succession five distinct armies.*

CAMPAIGN OF 1797.

Although four Austrian armies had been defeated yet the Aulic Council persevered in its efforts to regain its Italian posessions. By the 1st of January, 1797, Alvinzi's armies in the

* The advantage of interior lines and central position had now shifted from Alvinzi to Bonaparte whose masterful use of them contrasts strongly with Alvinzi's failure to appreciate and employ them.

† Throughout the fighting Würmser remained immovable in Mantua and made only a few half-hearted sorties. Alvinzi had not expected to arrive there until November 23d and had requested Würmser not to make any attempt to get out until that date—a request which was obeyed to the letter. Before the 23d Kilmaine had resumed the siege.

‡ Napoleon. "Campagnes d'Italie." Corresp. Vol. 29, p. 163.

§ *Vide* Sargent, p. 168, on which the forces are tabulated and compared.

Tyrol and Friuli were increased to 65,000 and Würmser with 20,000 starving men still held out in Mantua. The hope was incited to disregard the Armistice of Foligno * and to raise the Italians in revolt against the French. Alvinzi proposed a new plan. He proposed to advance with 28,000 men from the Tyrol on Rivoli, while Provera with 17,000 should move from Fruili on Verona and Legnago by an independent line,† and attack the French during which Alvinzi should defeat Bonaparte near Rivoli, sever his communications, and relieve Mantua.

Bonaparte, whose army had now been reinforced by 7000 troops from Provence,‡ had about 44,000 men, of which 10,000 were besieging Mantua and the remainder were on the Adige, between Corona and Legnago. The French commander had no plan, but keeping his forces united and in good intercommunication, awaited in his central position the development of the Austrian attack.§ On January 12th, Alvinzi's advance guard drove in Joubert's outposts near Corona, but Provera was repulsed by Massena near Verona with such ease that Bonaparte became convinced that the principal attack would not be made in this direction—a conviction which was confirmed by the information received next day of Alvinzi's attack and the scarcity of Austrian troops on the lower Adige or on the west side of the Lago di Garda. His decision was at once made and this day he left 2000 of Massena's division at Verona and directed all the other forces at his disposal to concentrate by forced marches on Rivoli, where Joubert was ordered to stop the Austrian advance. Alvinzi had expected to find the French in force at Rivoli, but he made the mistake of separating his six columns by impassable obstacles.‖ Bonaparte reached Rivoli after midnight on the 13th, and made a thorough reconnaissance which at once enabled him to comprehend the blunder made by his

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* *Vide supra*, p. 36.

† One would think that by this time the Austrians should have seen the inconveniences of operating by two lines, especially in the presence of Bonaparte. This was evidently not the case with soldiers so wedded to the past as they.

‡ Napoleon. "Campagnes d'Italie." Corresp. Vol. 29, p. 211.

§ *Ibid.*, pp. 213-214. Compare *supra*, pp. 9 and 36.

‖ "An army ought always to keep all its columns united in such a way that the enemy cannot introduce himself between them." *Vide supra*, p. 18.

adversary. Notwithstanding his inferiority of forces, he resolved to attempt to prevent the simultaneous arrival on the battle-field of Alvinzi's columns and to crush them in detail. On the 14th of January he fought the celebrated battle of Rivoli, the greatest of all his tactical victories,* in which with only 22,000 men† he utterly overwhelmed Alvinzi with 28,000. The battle cost the Austrians 8000 men. The pursuit by Joubert was prompt and energetic. On the following day 7000 more Austrians were captured and on the 16th Alvinzi, in his retreat to the Tyrol, could barely muster 13,230 men.‡

From the battle-field of Rivoli, Bonaparte turned southward with Massena's division on a forced march for Mantua to anticipate Provera, who had already forced Augereau's centre on the Adige, crossed the river, and had marched for Mantua, hotly pursued by that general. On the 15th, Provera reached Mantua, and on the morning of the 16th attacked Serrurier on one side while Würmser, issuing from the fortress attacked him on the other. Under ordinary circumstances Serrurier would have been crushed, but in war as in all great crises, even the minutes count, and the Austrians § had reckoned without the boy-general of 27, who had marched from the battle-field of Rivoli with Massena's weary division,‖ *night and day*, and on the morning of the 16th had arrived before Mantua. While Serrurier drove Würmser back into Mantua, Bonaparte united with Augereau and attacked Provera at La Favorita. The retreat of Würmser disengaged Serurrier, who promptly took Provera in reverse, with the result that his entire force of 5000 men was compelled

* "His tactical manœuvres at Rivoli were very similar to his strategical manœuvres within the theatre of operations. In both cases he brought a stronger force against his adversary at the vital point, while he held back with small forces the enemy's isolated columns." Sargent, p. 121.

† The battle was begun with 10,000 men. Joubert's division was soon reinforced by Massena with 8000 and later by 4000 under Rey, who arrived just in time to attack Lusignan, who had separated himself from the main army in making a flank movement to surround Bonaparte. *Vide* maxim, *supra*, p. 19.

‡ Sargent, p. 104.

§ "The Austrians in general do not know the price of time." Napoleon. "Campagnes d'Italie." Corresp. Vol. 29. p. 339.

‖ Massena's division had in addition marched and fought continuously for the 24 hours previous to the battle of Rivoli.

to surrender.* For 16 days longer Würmser's starving garrison held heroically on to a desperate hope, but on February 2d it capitulated.

With the surrender of Mantua terminated a campaign "which for brillancy and completeness remains unsurpassed by any single mititary operation in history." † *With only 44,000 men, Bonaparte had killed, wounded or captured nearly 43,000 Austrians* ‡ *and had annihilated the fifth Austrian army.* For the first time Mantua was in possession of the French, and Bonaparte was at last the absolute master of all Italy.

SECOND STAGE.

The fall of Mantua, coupled with the defeat of five distinct Austrian armies, threw Austria into consternation lest its own territory should next be the scene of war. The sixth army was raised to 100,000 men, and the Archduke Charles Louis of Lorraine, the brother of the emperor and the ablest of all the Austrian generals, fresh from his victorious campaign against Moreau and Jourdan, superseded Alvinzi in command. The projected reinforcements reached his army either late or never, so that when, on February 11th, he assumed command, his forces comprised only 42,000, composed of 10,000 Austrians and 10,000 Tyrolese militia in the Tyrol, and 22,000 on the Piave. The Aulic Council had moreover greatly hampered his operations by insisting that he should remain on the Piave to cover

* "The strategy and tactics which Bonaparte displayed in these three days' fighting in Italy give us, perhaps, a clearer insight into his system of war than any other single campaign in his remarkable career. His divisions were centrally situated. Strategically, the Austrians almost surrounded him; twenty-eight thousand were marching from the Tyrol upon Rivoli, seventeen thousand from Bassano upon the lower Adige, and twenty thousand were in his rear at Mantua. Having decided that the main Austrian army was approaching Rivoli, he concentrated there his available forces, took the offensive, and, though actually surrounded upon the battle-field, succeeded by his superior tactics in crushing Alvinzi's army; then, before the smoke of battle had died away, he led his weary but heroic troops toward Mantua, where he concentrated once more his forces, took again the offensive, overwhelmed and captured Provera's army, drove Würmser within the walls of Mantua, and forced him to capitulate."—Sargent, pp. 121–122.

† *Ibid.*, p. 122.

‡ The Austrians lost 15,000 men at Rivoli and in the subsequent pursuit; Massena had captured 1000 at Verona and Augereau 2000 near Legnago, Provera surrendered 5000 at La Favorita and Würmser 20,000 at Mantua.

the seaport of Trieste. He was therefore reduced to the defensive, and compelled to await the slow arrival of his reinforcements.*

Before the fall of Mantua, Bonaparte had formulated a plan for future operations, in which he purposed to use the Mincio as a base, and, defeating the Austrians, to cross the Tyrolean Alps and invade Austria, reinforced by 30,000 men, and with the coöperation of Moreau and Jourdan. He had communicated his plan to the Directory, which promptly ordered the divisions of Delmas and Bernadotte, numbering over 20,000 men, to cross the Alps to join him, thus bringing his effective forces up to 70,000 troops.

Early in March the Archduke had assembled 35,000 men on the Piave and 15,000 in the Tyrol, to oppose the French army of 52,000.† To oppose the Austrians in the Tyrol, Bonaparte sent Delmas and Baraguey-d'Hilliers to reinforce Joubert, whose command thus numbered 18,000, and ordered him to hold the Austrians in check and, if possible, to drive them over the Tyrolean Alps. Bonaparte retained the divisions of Massena, Serrurier, Guieu (replacing Augereau) and Bernadotte, in all 34,000 men, on the Piave, and on March 10th began his advance. On the 12th Massena, moving from Bassano, crossed the Piave and defeated at Longaro the division under Lusignan and captured that general. This exposed the Austrian right flank, and the Archduke accordingly withdrew behind the Tagliamento. On the 13th, Bonaparte with his three divisions, crossed the Piave, moving on Vabasone, where he arrived on the morning of the 16th to find the Archduke deployed for battle.

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* When the Archduke was appointed to command the Austrian armies in 1797, Bonaparte remarked to Maesfield, the Austrian envoy, "Your cabinet has sent against me three armies without generals. It now sends a general without an army."

The Archduke had proved himself a really great soldier. He was young—younger even than Bonaparte—but his views on war were the result of profound study, and his own successes in the field. Throughout his career his manœuvres were nearly always sound, and he was, beyond doubt, the ablest of all the generals opposed to Napoleon.

† The Directory had positively refused to ratify the Treaty of Bologna, signed March 1st, and thus deprived Bonaparte of a contingent of 8000 Sardinians. The refusal of Venice to conclude an alliance, forced him moreover to leave Victor and Kilmaine with 18,000 troops in Italy to protect his rear.

Keeping Serrurier in reserve, he directed Guieu and Bernadotte across the ford of the Tagliamento, and by a very skillful movement turned the Archduke's left flank and compelled him to retreat to the Isonzo at Gradisca with the bulk of his forces. The Archduke, however, directed Bayhlitsch with a large convoy through Undine on Tarwis to anticipate Massena, who was moving on Pontebba, and ordered him to unite with the débris of Luisignan's division under Ocskay, and to hold the passes of Pontebba and Tarwis, by which the reinforcements expected could most directly join him.

Meanwhile the French advance had continued. On the 17th Bonaparte had occupied Palma Nova and had driven the Archduke back to Gradisca where he captured the garrison there entrenched on the 19th and forced the Archduke, whose left was supported by those entrenchments, to retreat across the Isonzo through Adelsberg on Laybach in order to avoid being thrown into the valley of that river and his retreat severed. Bernadotte was ordered to pursue him while Bonaparte with the divisions of Serrurier and Guieu turned northward after Baylitsch. Massena had, in the meantime, defeated Ocskay, and by seizing the Pass of Tarwis, had completely enveloped Baylitsch. This was just what the Archduke had feared in the critical situation in which he now found himself. All of his forces had been defeated and scattered, and were everywhere retreating. He accordingly ordered his main force to follow as fast as possible through Krainburg while he hastened in person to Villach where his reinforcements had already begun to arrive. Assembling 6000 fresh troops, he united them to Ocskay and made a desperate effort amid the ice and snow, above even the clouds, to dislodge Massena from the Tarwis Pass. His attempt was partially successful, but the stubborn Massena eventually regained the possession of the pass and forced the Archduke to retreat to Klagenfurth. Then turning on Baylitsch, he attacked the head of his column simultaneously with Bonaparte's attack upon his rear, and forced that general to capitulate with 4000 men and an immense quantity of baggage and ammunition. Bonaparte then occupied Villach.

Joubert had, meanwhile, ascended the Adige, routed the Austrians at St. Michael on the 20th and at Neumarkt on

the 22d, at which latter battle he had separated Laudon and Kerpen, driving the former on Meran and the latter on Brixen. Following up Kerpen, he again defeated him in spite of reinforcements at Klausen on the 24th and at Mittenwald on the 28th, and forced him to retreat over the Brewner Pass. Turning then toward Brixen he made preparations to crush Laudon, but, on learning that Bonaparte had reached the Drave, moved through Innichen to rejoin him at Klagenfurth,* which Bonaparte had occupied on March 31st.

Notwithstanding the revolt of the Venetians which had threatened his communications and the failure of the French armies on the Rhine to advance into Austria, Bonaparte put on a bold front and wrote to the Archduke suggesting peace, to which a reply was made that the Archduke had no authority to treat. Bernadotte, who had advanced through Krainburg, had now rejoined him, but without waiting for the arrival of Joubert.† Bonaparte attacked the Austrian advance guard at St. Veit on April 1st, overthrew it, and pursued it to Neumark, where he encountered the concentrated army of the Archduke reinforced by four divisions from the Rhine. After a desperate fight the Austrians were again compelled to retreat with a loss of 1000 men. At Unzmark, on the 2d, the Archduke made another stand, but was once more forced to retreat with loss down the Mur, followed by Bonaparte, who entered Leoben on the 7th.

The Austrian Court in consternation requested a suspension of hostilities for ten days, of which five were granted. On the

* It has been declared that Bonaparte violated the principle upon which he laid so much emphasis himself, viz.: that an army must have but one line of operations. Although at the outset he purposed to rally Joubert to him by the valley of the Drave, yet had he never crossed the Julian Alps, Joubert would never have entered the Drave. There was in reality only one line of operations. Joubert was ordered to act merely to protect the communications of the Army of Italy from attacks by the Austrians from the Tyrol by holding them in check. That he should drive them over the Tyrolean Alps was a secondary consideration (*vide supra* p. 54 and Derrécagaix, part I., pp. 256–258). His rôle was that of a containing force—like that of Vaubois in the campaign of 1796 (*vide* p. 40)—while "in reality, the decisive movement, that of the army proper, was to take place upon a single line of operations, the line of Friuli." (*Vide* Derrécagaix, part I., p. 259.) Although it may appear that there were two lines of operation, there was however only one. Napoleon never operated but by one single line. (Jomini, "Grand Military Operations," Vol. II., p. 11.)

† *Vide* Stephen, "Revolutionary Europe," p. 192.

12th envoys arrived and on the 17th was signed the preliminary Peace of Leoben, whose terms were generally embodied in the definitive Treaty of Campo Formio (October 17, 1797.)*

The last stage of these two wonderful campaigns was ended. *In one month Bonaparte had captured, killed or wounded more than 20,000 Austrians and had defeated in every battle the sixth Austian army commanded by the greatest soldier whom Austria has ever produced.*† The Preliminaries of Leoben crowned Bonaparte's great victories, and the monarchs of Europe quickly recognized that they had no longer to deal with the French Republic, but with the young Corsican general."‡

Such was the Napoleonic Strategy. Its chief characteristics were, as we have seen, (1) the initiative at the commencement of operations, (2) one line of operations, (3) the unity of forces, (4) rapidity of movement, and (5) concentration before battle. The principles which have been laid down for their observance may be condensed briefly into two great maxims, viz.: (1) Surprise and, by rapidity of movement, outmanœuvre your enemy, and (2) Never be vulnerable on any point.§ These principles are nowhere better demonstrated in all Napoleon's great operations than in the campaigns of 1796 and 1797. "In that single year, the first in which he commanded an army, he illustrated completely the system of war which deserves to be styled the Napoleonic, since he was, if not its inventor, its greatest exemplar."‖ The world had never before seen, and probably will never again see, another such consummate master of the art of Strategy as Napoleon Bonaparte.

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* *Vide* Stephen. "Revolutionary Europe," p. 192.

† Sargent, p. 144.

‡ Stephen, p. 186.

§ Compare Napoleon's comments on Cæsar, *vide supra*, p. 8.

‖ Hamley, p. 471.

Translations and Reprints.

THE ART OF WAR BEFORE AND AFTER THE RENAISSANCE PERIOD.

By HENRY ELLIOT MALDEN, Vice-President Royal Historical Society.

(*From the United Service Magazine.*)

HE who would build must in the first instance find his materials, or have them found for him, and it is impossible to overestimate the service done for historians of the art of war by the compilation of such a book as Mr. Cockle's "Bibliography of Military Books up to 1642." A writer who, as Mr. Oman justly remarks in the preface which he contributes, is generally confronted at the last moment by some hitherto overlooked tract which traverses his views and which invariably turns up just after the final revision of the proofs, is less liable to such a catastrophe when so thorough and complete a list of authorities is prepared for him. Nor has Mr. Cockle been content with a bare list. A catalogue *raisonné* is here presented to us, which gives some idea of the contents of the books mentioned, the position of the authors, and their relations to other writers. A few illustrations and plans from the earlier works, add much to the use and piquancy of the whole It is almost ungenerous to criticise so ample a feast, and presumptuous too, seeing that there can be but few who have spent the time and pains bestowed by the author upon the subject, or who can pretend to anything like so nearly a complete knowledge of the early literature of war. The subject, to which this book is a guide, is one peculiarly interesting from the historical point of view ; as the history of an art once, it was thought, perfected then retrograde, then recovered, and then immediately modified by new discoveries.

The art of war is one of those in which great progress was made in antiquity. It was elaborated for many centuries, and

then retrograded or at best remained stationary for many more. It was revived by means of the study of ancient examples, about the period of Renaissance, when Mediæval Europe made a new start in so many directions by trying back to the recovered and restudied materials of the past. The past of war was then far more instructive than the present. The perfection of Greek military science under the Macedonians, Philip, Alexander, Demetrius Poliocretes, Pyrrhus and others had been followed by the elaboration of Roman tactics. It is not certain that this involved an advance in efficiency in all directions. The Roman Legions were beaten, with difficulty, by the Phalanx in the hands of Pyrrhus. They beat Pyrrhus at Beneventum, not, *pace* Lord Macaulay, by breaking the Phalanx, but when Pyrrhus owing to the loss of his original veterans, had to depend upon Italian and other mercenaries armed in the Italian fashion.* The constant wars of Rome led to the training of the professional and national infantry of the Legion to such a degree of perfection in their peculiar tactics and the use of their weapons, as to make them superior to all other infantry armed in any manner. But their opponents were nearly always either comparatively untrained militia, mere mercenaries with no great heart in their cause, or gallant barbarians with inferior weapons and no particular science. It is doubtful whether in the attack and defense of fortified places the Romans equalled the Macedonians till after the end of the Punic and Spanish wars; in the sieges of Numantia and Carthage the science was not on the side of the Romans; and it is certain that in the intelligent use of cavalry and light armed troops they were behind Alexander for a very long time. We must remember that they had no national cavalry or archers, worthy of the Legions. From the days of Pompeius and C. Julius Cæsar they had at their command all the science and experience in war of civilized Europe and Western Asia, and ample fields for the recruiting of cavalry and light armed troops among the Gauls, Germans, Africans, and other provincials, who were as thoroughly loyal soldiers to the Empire as any peasant of Latium, if such still existed. Marius, Sulla, Pompeius, Cæsar, Vipsanius Agrippa, are the leaders under whom the Roman armies probably attained, progessively,

* See Art. "Pyrrhus in Italy." *Journal of Philology.* Vol. X. 1882.

the high level of excellence which they maintained for centuries. They were then superior to anything which had gone before. It is likely that they were superior to anything which was to come after, for very many centuries.

Alterations were made, which may or may not have been improvements from the purely military point of view. Political reasons led to the resolution of Legions into smaller regiments. The old weak point of the cavalry and light armed being less efficient than the infantry, had been partially remedied, but on one fatal day left the latter to be ridden down unsupported by the Gothic cavalry at Adrianople. The resuscitated Imperial armies of Theodosius were filled more and more with German, Gothic and other barbarian soldiers, and amending their former error perhaps too thoroughly, depended more and more for their strength upon heavy cavalry and archers. New arms and new tactics were introduced to meet new enemies, and the science of fortifications was elaborated, or at least fortifications were multiplied more and more. The armies of the later Empire, directed by a school of trained officers and supported by the resources of a civilized government, maintained the cause of civilization under great difficulties. Social and moral evils, not military inefficiency, led to the successful intrusion of barbarians within the Empire. From the East, where the seat of the government was, the earlier coming barbarians were successfully repelled, and their successors kept at bay for centuries. The armies of Belisarius and Narses, those of the great Heraclius and of the Isaurian Emperors were obviously most ably equipped and directed fighting machines. The "Strategica" of the Emperor Maurice in the sixth century A.D., the "Tactica" of Leo VI. in the ninth and tenth centuries, reveal to us the military organization which continued to support the Roman Empire in the East against the persistent attacks of formidable enemies. It was an organization based upon the preserved experience of antiquity, modified to suit new dangers and restricted recruiting fields.

The primitive valor of the Western Europeans was by degrees organized more or less in imitation of it. The Goths had fought as men-at-arms of the mediæval pattern, the Franks had fought on foot with axes and javelins. The rest of the Ger-

manic people had usually done the same as the Franks. If they took to horses, in order to overtake Scandinavian raiders and Hungarian cavalry, if they gradually raised stone castles to guard important roads and passages, instead of relying upon the old national palisaded mounds, if they surrounded cities with stone walls, they only copied what the Romans of the East had long practised. The Normans who conquered at Hastings by dint of using cavalry, archers, and heavy armed infantry each in their proper place, and who guarded their conquests by stone walls, had of all Western people been in closest touch with the Eastern Romans. When mediæval armies were not a nucleus of disorderly men-at-arms followed by a rabble of half-armed foot, they were a distant copy of the armies of Belisarius. Over the whole West there was no advance beyond a level reached long before; in the East there was no advance because of financial, political and geographical limitations. The soldier of Marius, or of Alexander, had within his reach as good arms as the soldier of Edward the First. Only in military machines there had been an advance; and one discovery, Greek fire, played an important part in sieges and naval warfare.

Where mediæval was conspicuously behind ancient military science, was in the want of the complete political organization which of necessity lies at the root of all military organization, and makes the difference between armies competent to carry on war, far off or for a long time together, and armies formidable for one invasion or magnified raid upon a near neighbor. The Crusades were distant expeditions, of huge forces; but for want of this organization they were miserably unsuccessful, looking at the numbers and the zeal of the crusading armies. So it was with all mediæval forces.

We may amuse ourselves by speculating as to what would have been the result had the army with which Edward the First won Falkirk been pitted against that with which Cæsar won Pharsalia. National pride might warp our judgment of the results of a stand-up fight. No national pride will prevent our acknowledging that the organization necessary for success in a campaign would have been on the side of the Roman. Imperial armies were probably far superior to any mediæval army, because the government was far more efficient, the roads very

much better, the intelligence of their staff more complete, their engineers cleverer, the resources upon which they depended far more abundant, the military chest better filled.

It is no wonder that when in the fifteenth century the experience of antiquity was again extensively studied in every department of life, and that when statesmen and soldiers saw that their long gone predecessors could raise armies of a size which they could not equal, keep them in a state of discipline which they must have regarded with despairing envy, marched them where they could not go, and fed and paid them with a regularity which they could not approach, the military writers of antiquity should be eagerly studied. Italy led the way in this revived study, as in others. The country of Scipio, Sulla, and Cæsar, the great Condottieri of the later Middle Ages, Pescara, Parma, Montecuculi and Napoleon, may claim a foremost place in practical war. The country of Macchiavelli was first in the field at all events in treating of the theory of arms. Polybius, Cæsar, Arrian, Ælian, and Frontinus were the accepted guides for commanders during the Renaissance. Above all Vegetius, who dedicated his "Rei Militaris Instituta" to the Emperor Valentinian II. about A.D. 375, became a great authority, though the real worth of his book is not equal to its reputation. In the latter part of the thirteenth century the Italian Egidio Colonna had studied him as a military guide, and reproduced much of his work in "De Regimine Principum" printed at Augsburg in 1473. Jean de Meung translated him into French before 1300. In 1408 an anonymous Englishman, perhaps named Clifton, also translated Vegetius. In 1488 a lady, Christine de Pisan, translated him again into French, and did much to fix military phraseology for awhile by her version. Caxton in 1489 translated and printed Christine de Pisan in English; a book with which Mr. Cockle opens his English Bibliography. But Vegetius was the authority on war for the sixteenth century. Fluellen's idea of "good knowledge and literature in the wars" was no doubt a knowledge of Vegetius.* Every pedantic or would-be scientific soldier of the early En-

* Fluellen also seems to quote from the Laws and Ordinances laid down by Robert Earl of Leicester for the use of her Majesty's troops in the Low Countries, 1586.

glish dramatists is full of allusions to the Roman wars, and had there been a Staff College in existence any time before 1700 the inmates would haye been examined in Vegetius.

But other writers of the fifteenth century deduced general lessons from the history and maxims of antiquity. Macchiavelli's "Art of War" is, of course, a most able *résumé* of past experience applied to present conditions. In spite of the exploits of Flemish pikemen, Swiss halberdiers and pikemen, English archers and Turkish Janissaries, cavalry was considered the principal arm of the later Middle Ages. But Macchiavelli, largely influenced by ancient authorities, is most urgent on the superiority of infantry over cavalry, and the use and improvement of the Swiss pikemen and of the famous Spanish infantry, who in a fashion reproduced the one the close formation of the Phalanx, the other the more flexible lines of the Legion, show that practical soldiers were of his way of thinking. Strong evidence in favor of the real sagacity of the great Florentine is given by the fact that so practical a person as Frederick the Great valued his treatise 250 years after his time. Other of the great Italians of that great age turned some attention in the same direction; Leonardo da Vinci wrote on the theory of artillery, and Michael Angelo, among his many avocations, was a military engineer.

Strong governments, controlling the resources of large countries, were again making their appearance in Europe in the Renaissance period, holding out the possibility of turning the experience of the past to more practical use than could have been the case when all European governments had been very poor, comparatively speaking, and exercised little more than a circumscribed local control in their nominal dimensions.

But just at the time when the past masters of the Art of War were being resuscitated and restudied, the real revolution was setting in which was destined to make the conduct of battles, and ultimately, to a great extent, of course, of strategy also, something quite different from anything which had been dreamed of by Polybius, Arrian, or Vegetius, by Leo the Philosopher, or even by Macchiavelli. The last dismisses fire-arms as rather fit for frightening than hurting an enemy. Artillery, in the modern restricted sense of cannon had, of course, begun

to play a considerable part before Macchiavelli wrote. Cannon were used in battles by land and sea, and in sieges, in the fourteenth century. They were of importance before the middle of the fifteenth. To take English examples only, Henry V. employed them in his sieges in France. Salisbury was killed by a cannon shot at the siege of Orleans. The French guns cut through Talbot's men at Castillon. The battles of Northampton, Tewkesbury, and Blackheath were partly decided by them. They were used at Bosworth. But, after all, the general principles of the use of ancient machines were perhaps fairly applicable to the use of cannon of those days. The use of musketry, "hand guns," was a later invention, making less stir at first, but destined to make more rapid changes a little later. Edward IV. had Flemings armed with "hand guns" with him when he won back his throne in 1471, when he fought Barnet and Tewkesbury. The Spanish infantry used them extensively in the Italian Wars of the fifteenth and early sixteenth centuries. The formidable power of the Turks made great use of artillery in the fifteenth century, and quickly adopted musketry in the sixteenth.

One of the most distinguished writers of the day upon the theory of artillery was moved to his researches by the hope of enabling the Christian powers to check the Turks. This was Tartaglia, the mathematician, living in the earlier half of the sixteenth century, who was the man who first began to approximate to an idea of the true flight of a projectile. One opinion before his day was that a cannon-ball described in its course two sides of a parallelogram, continuing to fly in a straight line till it dropped perpendicularly. Perhaps Warwick's gunners aimed on this principle when in the dark, on the night before Barnet field, they failed to hit Edward's men at a range of half a mile. Tartaglia was not correct. He thought that a horizontal line of flight was connected by the segment of a circle with a perpendicular line of descent. But it was an advance. A still greater mathematician, Galileo, seems to have first won acceptance for the true theory of the parabolic flight of all projectiles. One would think that rule of thumb must have long made the practice of gunners better than their theory. No one, however, could dispute that cannon were an obvious advantage.

Musketry had to make its way in England against the prejudice in favor of the old national infantry weapon, the long-bow Even Scotland was in advance of England in using it. The Scotch kings had long been users of artillery. James II. in the fifteenth century had reduced the castles of the Douglases by the aid of guns made by his Flemish Master of the Ordnance, Fleming of Monzie, the maker of Mons Meg. Hermitage Castle on the Borders is pierced with what we may call two portholes —they are scarcely embrasures—for guns, made at a period when few, if any, English castles are so fitted. But the Scotch use of artillery was not always fortunate. James II. was killed by the bursting of one of his own guns at Roxburgh. James IV. misused and lost all his artillery at Flodden, besides the field and his own life. At Pinkie Cleuch the Scots had musketry, the English long-bows, and the Scots were routed with heavy loss. Indeed, given the continuous and careful practice bestowed in England on the use of the bow, and given a day neither very windy nor very wet, it is possible that by rapidity and precision of shot, archers might be more efficient than men with antiquated fire-arms. We may remember, too, that the materials for gunpowder did not exist in England, charcoal excepted, and that we imported all our powder till Henry the Eighth's reign.

Nevertheless, Ascham's "Toxophilus," the greatest work on the use of the bow, published in 1545, was written when it was about to disappear as a military weapon. The bow had reached its perfection when Edward I. had marked the excellence of the South Welsh archers, and had organized military archery on their model. The harquebuss, the caliver, the musket were in a continual course of improvement. Their construction, range and accuracy were getting better and better, though poor indeed as tried by our standards. It is very possible too that they had to compete with deteriorating archery. To keep up the very high standard of old English archery required very strenuous practice. From the days when Edward I. had seen it in the Barons' Wars, down to the end of the Wars of the Roses, England had been continually at war, abroad and at home. For more than 230 years onward, from about 1260, there had never been real peace for ten years together. Under this press-

ure archery had been kept up. From the time when the Cornish archers kept the bridge below Blackheath against the king's artillery in 1497, England, though often at war abroad, was far more peaceful at home. There was no great battle on English soil between Flodden in 1513 and Edgehill in 1642. Solway Moss, on the Debateable Land, was scarcely in England and scarcely a battle. In the sharp fight at Crediton, in 1549, foreign mercenaries with fire-arms beat the peasantry with bows. The foreign wars of the earlier sixteenth century, in which we were actually fighting, were not so great nor so continuous as had been the case. The practice of archery was decaying if we may trust the statutes, which often refer to its neglect. In the reign of Elizabeth the contest was decided. Englishmen were engaged as auxiliaries in great foreign wars, in the Netherlands or in France, where archery was quite out of fashion. The foreign manuals of war which we used had no reference to it. Maurice of Nassau, Parma and Henry IV. were equally oblivious of it. A new form of armament, and new methods of training were wanted for these wars. Still, the old-fashioned people cried out for the old methods, like the bow. The muzzle-loader too, we may remember, kept a place in England longer than anywhere else. Mr. Cockle recalls the controversy to us, by recording the work of Sir John Smythe, who in 1590 still advocated the use of the bow. His book was printed, he said on the sufficiently long title-page, "for the benefites of this his native countrie of England." But not only was it not successful, it was suppressed by authority, and the author declared by her Majesty's Council "to have been some years in his dotage." The rude methods, and language, of the sixteenth century would not be out of place always now. Necessity, it is true, had for a time fought in the cause with Sir John Smythe. When levies had to be raised against the Armada, archers had formed a considerable proportion of the force. Probably there were neither arms nor powder for sufficient men with fire-arms. The Deputy-Lieutenants of Surrey had in fact declared as much, saying that they could not send the men required in 1588 unless they might substitute bows for "shot." It was not till 1599 that the county raised levies, for an Irish expedition, exclusively armed with pikes and "calivers," with no bows

among them. The case is probably a fair sample of what happened in any English county.

Yet archery died hard. In 1625 John Neade wrote the "Double Armed Man," in which he recommended an invention of his own, a pike with a bow fixed upon it. In 1628 an anonymous author recommended the use of "fire shafts" shot by the bow. He wished his invention to be tried upon a bull turned loose on a common, "when haply the madding of the enraged beast would teach some profitable stratagem for war." It possibly would teach alacrity in seeking cover. Up to the Civil Wars archery had its advocates in England. It had been used too, not long before, elsewhere. Scott made a curious slip when, in "A Legend of Montrose," he made Major Dugald Dalgetty so contemptuous of the archery of the Highlanders. The old soldier of Gustavus would have known that when the Swedish king landed in Germany in 1630 he had with him a body of archers from Dalcarlia. This is perhaps the last instance of the appearance of archery in any European army, except among the Turks and Russians, if these may be called European.

The Netherland wars, in which English archery was finally dropped, formed a great epoch in military art, especially in regard to fortifications and siege operations, and the bulk of military literature increased according. These wars were suspended in 1609; but the Thirty Years' War began in 1618, and the Netherland wars were resumed in 1621. The same school of soldiers and of writers were continuously employed. In the whole series of wars English and Scots were employed in numbers, but as auxiliaries. Some of them played a distinguished part, and gave their countrymen the benefit of their experience too, as Sir Francis Vere, a fine portrait of whom is given us by Mr. Cockle, in his "Commentaries," or Alexander Leslie, Earl of Leven, in his "Direction and Order for the Exercising of Horse and Foot." But the School of War was foreign, and English writers upon it either translated foreign books, or drew their examples from foreign experience. Like Captain John Bingham, who illustrated Ælian by examples and maxims drawn from the campaigns and discourse of Prince Maurice of Nassau. The date to which Mr. Cockle takes us at present, 1642, forms an epoch for Great Britain—may we hope for fur-

their guidance in the future? The outbreak of the English Civil Wars brought into play here men who had been trained and theories which had been adopted on the Continent, and shortly gave us our first really organized army, the New Model. With regard to the Continent, the peace of Westphalia, 1648, or of the Pyrenees, 1659, would form a more natural halting-place. When the greatest writer of the school which then prevailed, Montecuculi, wrote, it was seen how essentially an age of transition had passed in the long wars which had found Spain and left France the supreme military power of Europe. The Netherland wars had been begun with armies which were half mediæval, but with artillery multiplied and musketry added. The charge of Alexander of Parma, lance in rest, at Gemblours in 1578,* of Sir Philip Sidney with the handful of English gentlemen at Zutphen in 1586, were the exploits of knights of the Middle Ages. The armies at the end of the Thirty Years' War had more in common with the armies of Marlborough in tactics and in arms, though the bayonet was not yet in use, than with the armies of a hundred years before. The armies of Marlborough had more in common with those of Napoleon than the latter had with those of to-day.

In a work of such completeness and research as this which has given us the text for this brief sketch, it is hard to find omissions and wrong perhaps to complain of the absence of that which the author has deliberately left out. But as a guide to authorities upon the history of the art of war it would be more complete still for the mention of the histories of wars. We may learn much of Roman tactics, military equipment, and organization from the once well-studied Vegetius. It is a question whether we cannot learn more by an attentive study of Cæsar's Commentaries. Sir Walter Raleigh's "History of the World," worthless for its avowed purpose, has very striking reflections upon some of the larger problems of war in his own day. Strada's "Wars in the Netherlands" is a mine of information about the armies of Parma, Maurice, and Spinola; and Knolles' "History of the Turks" has remarks upon Turkish warfare, and examples of it, which light up a side of the subject not much touched in the writers cited here. The strictly

* Motley, Part V., chapter iv.; Strada, ix., 266.

chronological arrangement of books, according to the date of publication, followed in the Bibliography, has great advantages in allowing us to follow the development of general military knowledge. An unprinted book, in the days since printing was invented, is not likely to be well known. But a wrong impression of the progress of ideas is conveyed by relegating to their date of printing books which were composed long before that invention. MS. books had a certain circulation. If a soldier like Egidio Colonna studied Vegetius, and gave the fruit of his studies to the world in 1284, both Vegetius and Colonna were obviously authorities before 1488 and 1473 respectively, when they first appeared in print. This plan excludes from the present work altogether one most interesting English writer. Nicholas Upton's "De Studio Militari Libri Quatuor" were, we believe, only printed in 1654, but they were dedicated to Humphrey Duke of Gloucester, who died in 1447. Upton served under Henry V. and the Earl of Salisbury in the French wars, and was at the siege of Orleans. The main objects of his book may be considered heraldic and ceremonial, but he cites at length the ordinances for the discipline of his army published by Henry V., refers to the practice on various points of commanders from the time of Edward III., and by his references to our old friend Vegetius, and to others, gives us another example of how faithfully the scientific warriors of that period tried to follow in the footsteps of those Roman commanders whom they looked up to, and back to, as the real masters of a perfected art which they longed to copy so far as their times allowed.

DOES PHYSICAL LAW APPLY TO THE HUMAN BODY?*

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(*From the Cincinnati Lancet-Clinic.*)

A LAW of physics is that it requires the same energy to raise the temperature of an inorganic or dead organic body five degrees as it does to depress it five degrees.

Does not each human body have a point in the external atmospheric temperature, its normal plane, at which the body being at rest, the energy required to maintain vital forces is at a minimum?

Does not each degree of external atmospheric temperature, above or below this plane, result in the expenditure of an equal amount of energy to maintain its equilibrium?

Voit has shown as a result of his study of man that the exhalation of carbon dioxide diminishes from 4.4 degrees until the temperature reaches 14.3 degrees, when it rises slowly.

Page has found in experiments on dogs that the discharge of carbon dioxide was at a minimum at about 25 degrees; that above and below this point the discharge was increased, and that at 40 to 42 degrees, greatly so, reaching three and one-half times the normal at the latter.

Landois and Sterling say that if mammals are placed in a warm bath which is two or three degrees above their own temperature, that the excretion of carbon dioxide is increased, owing to the stimulation of their metabolism. They also say that the lung excretes seven grammes more of nitrogen than it takes in.

Halliburton says that both heat and cold increase the excretion of carbon dioxide. Ray and Graham say that the capillaries are contractile as well as elastic, and it is by the contractility of the capillary wall, as a whole, that the diameter of these vessels will change, and to all appearances their contractility is constantly in action. The individual capillary (in all probability) expands and contracts in accordance with the re-

* Read before the Academy of Medicine of Cincinnati, June 11, 1900.

quirements of the tissues through which they pass. The regulation of the vascular blood flow is thus more complete than is usually imagined.

Under the normal it takes the blood twenty-three seconds to complete the circuit from the left to the right. It would seem from the above that there is a normal temperature plane somewhere near 25 degrees. It is not stated whether the man experimented on was clothed or not, and 11 degrees difference seems too great between the dog and the man, for the man not to have been protected with clothing from the action of the temperature.

Why, then, in considering the diet for hot climates, should not these facts have consideration? for this increased excretion of carbon dioxide can only mean greater work being done. Therefore, if the energies are to be kept at the normal, this expenditure of energy must be replaced by food. I shall suppose that figures given by Notter and Firth are taken at 25 degrees when they say that to maintain the human body in equilibrium at rest it requires the expenditnre of 2800 foot tons of energy per diem. This is equal to 112 foot tons per degree. Therefore if physical law applies when labor is being performed with the temperature at 20 degrees, we have 560 foot tons required to balance this fall of temperature; and at 30 degrees we have to expend the same energy, owing to the rise in temperature. Should labor be called for we know that then there is an increased amount of heat generated; for the human body in place of energy expended yields 80 per cent. of heat and 20 per cent. of work.

Light work is from 150 to 200 foot tons.

Average work from 300 to 350 foot tons.

Hard work from 450 to 500 foot tons.

Laborious work from 500 to 600 foot tons per diem.

But with the 300 foot tons per diem of labor we have 1200 foot tons of energy as heat to rid the body of, if its temperature is to remain the same.

Now if this work is to be done at 20 degrees, the demand on the economy is 560 foot tons less than at 25; or 640 foot tons of heat energy which the body has to lose; while at 30 degrees the amount which has to be cared for is 1760 foot tons. and it is this unloading of the body of heat energy which causes

exhaustion from life in the tropics, and the increased energy and weight, the increased appetite and ability to assimilate food of the northern climates, for the heat generated by the contraction of the muscles will replace the demand made for heat by the fall of the atmospheric temperature; while with the increased heat above the normal plane it is simply an added heat which has to be removed from the body if its temperature remains at its normal.

I offer the following to explain, in part, the above (all reference to the nervous system is intentionally left out, and not lost sight of).

The circulation of the fluids of the body is accomplished by means of a central heart and the rhythmical contraction of the involuntary muscular system of the vessels of the body and the cells of the capillaries. This is the so-called skin-heart. This skin-heart greatly assists the central heart in unloading the capillaries by direct action down the artery.

These vessels of the skin-heart have their normal plane of temperature in the skin. A fall below or rise above this plane results in a change in the calibre of the vessel, to permit the passage of more blood through the skin to heat the skin in the one case, to cool the blood in the other, with the result of labor done by the involuntary muscles of the vessels and of the cells of the capillaries, the skin-heart; hence from this labor results an increase in carbon dioxide.

I find it difficult to think that the heart, giving about three pounds to the square inch of pressure in the main vessels, could drive the blood from the left to the right in twenty-three seconds, without the skin-heart assisting. When the great mass of the skin-heart is considered, it will be readily seen why the total labor reaches the point that it does, and we will appreciate its importance in the mechanism of heat regulation when we consider that this skin-heart carries off over 80 per cent. of the labor of regulating the temperature of the human body. We thus see why hot, moist atmosphere so soon exhausts a man at labor, for it is the exhaustive labor of regulating the body temperature thrown upon the involuntary muscular system of these small vessels and of the cells of the capillaries whose entirety is so large. This exhaustion does not come from the labor of the

voluntary, but from that of the involuntary muscles unloading the heat generated by the contractions of the voluntary system.

I translate Notter and Firth that they mean that the circulation, respiration, etc., by their labor, use up about 2800 foot tons per diem at 25 (the supposed normal temperature plane); of this 80 per cent. is heat to hold the body at 37, when the air is at 25; for each degree above this there is added 112 foot tons, while when the bodily energies are expended for labor, 80 per cent. appears as heat and 20 per cent. as labor. The involuntary system has to carry the load of dissipating this heat. Therefore, it would appear that the involuntary muscular system uses the greater part of the energy expended by the body during labor in hight emperatures.

We are told that we should keep down our food allowance in the tropics, because experience in the tropics of the native there has shown that man must live on vegetable food, because, owing to the heat energy of the atmosphere, man does not require the same amount of energy to support his vital forces. I think that the above reasoning shows that, to the contrary, he needs more; for when exposed to cold below his normal temperature plane he protects his skin-heart with clothing and warm rooms.

The experience of mankind shows that when called upon for continuous labor all men prefer a meat diet, in spite of the fact that the urine does not show a very great increase of urea.

Landois and Sterling say that the experiment has shown that the lung gives off seven grammes of nitrogen per diem more than it takes in. If the expired air of labor contains the same relative amount of nitrogen which it in a state of rest does, and I think it is a just supposition, then we will have an excretion, under ordinary labor, of about nine grammes per diem; and under hard labor more. (Nine grammes of nitrogen correspond to about sixty grammes of proteid.) Notter and Firth, on page 143, give this table:

	Ordinary Air.	Expired Air.
O	20.96	16.40
N	79.00	79.19
Co_2	04	4.41

If we make the calculation on the basis of twenty cubic inches of tidal air, and sixteen inspirations to the minute, we have for the twenty-four hours:

$20 \times 16 \times 60 \times 24 = 460{,}800$ cubic inches air.

$460{,}800 \times .79 = 364{,}032$ cubic inches of nitrogen in ordinary air.

$460{,}800 \times .7919 = 364{,}907$ cubic inches of nitrogen in expired air.

$364{,}907 - 364{,}032 = 875$ cubic inches of nitrogen, excess in the expired air over that inspired; 875 cubic inches of nitrogen weighs 279.6 grains, or 18 grammes, an amount about equal to the total amount of nitrogen excreted by the remainder of the body.

So one can readily understand why one wishes more meat when doing labor, and why the laborer who has a full meat diet is more content and in better condition than one who has not.

The laborer of the tropics does not take rice, bananas, etc., and do without meat, from choice, any more than the Irish cotter lives on potatoes from choice, and the Esquimo upon fat. In each case the food habit is very largely a matter forced upon the race by the circumstances of its surroundings. The vegetable food of the tropical laborer is due to the fact that vegetables are cheap and readily had, and nitrogenous diet expensive and hard to preserve. In the Arctic vegetables are difficult to get. Hence the one lives on vegetable matter and a small amount of proteid; the other on fat and proteid, and very little vegetable.

Custom has given liking to each for his own diet. We are accustomed to say and to feel that when we go into the tropics that we must reduce the food allowance because, owing to the heat we need less, and because, if we use it, it will make us sick, because we do not need it, and it is simply overloading our bowels and kidneys with matter we cannot use. This I think is an error, for we one and all to-day think that our diseases are caused by foreign germinal matter introduced into our bodies.

It is well known that the tropics, with their higher atmospheric heat and water content, permit a most rapid growth and existence of these germinal matters. Our foodstuffs are one

and all good culture media for these growths, and yet we work on the basis that these diseases are due to the dead organic matter upon which we feed and upon which in colder climates we prosper and are filled with energy; and yet we have botulism here in this climate. It were far better to look to it that these foods remained dead organic matter and to see that they do not become filled with living organisms.

The loss of body weight in the tropics is due to the use of more energy than is supplied, and the loss is greater in hot, moist weather, simply because under these conditions the demand upon the skin-heart is greatest. I have recently seen the statement that the native of the tropics who lives upon rice, fruits, etc., has a greater liability to, and greater mortality from the bubonic plague and cholera than his brother who eats a larger amount of meat and other nitrogenous food. This would seem reasonable, for with better diet comes increased resistance to attack and to disease when attacked.

I had charge of three hundred convalescents and fifty nurses in the tropics for several months, and I found that these men consumed all of the beef, eggs, chickens, ducks, etc , which I could obtain for them, and wanted more. I think that the record will bear me out that these nurses and convalescents were in as good condition as in any of the other hospitals of my locality. My personal experience was that while I tried to live on a vegetable diet, etc., as dictated by theory and custom of the tropics, that I needed less food, and that of a different character, that I was despondent and uncomfortable, and that when I returned to my full meat diet my energies returned. My native servants ate, with evident relish and benefit to their bodies, all the meat my personal mess could spare them.

If 2800 foot tons is the expenditure at rest per diem, and 300 foot tons of labor done at 25 degrees, then we will have 2800+300+1200 equal to 4300 at 25 degrees.

2800+560+300+1200 equal to 4860 at 30 degrees.

2800—560+300+1200 equal to 3740 at 20 degrees.

In other words, to work at 300 foot tons per diem in a temperature of 30 degrees we expend rather more than 1100 foot tons per diem doing the work then at 20 degrees.

30 equal to 86 degrees Fahrenheit.

20 equal to 68 degrees Fahrenheit.

25 equal to 77 degrees Fahrenheit.

In other words, man must digest more at the higher temperature; must supply 112 foot tons of energy per diem for each degree, Centigrade, that the atmospheric temperature goes up. And all this labor falls upon the involuntary muscular system of his vessels.

I take the following table from Thompson's "Dietetics":

An adult doing moderate work gives off in grammes:

	Water.	C.	H.	N.	O.
By respiration	330	248.8	. . .	(?)	651.15
By perspiration	660	2.6	. . .	. . .	7.2
By urine	1700	9.8	3.3	15.8	11.1
By fæces	128	20.	3.	3.	12.
Total	2818	281.2	6.3	18 6	681.45

From what I find in Landois and Sterling I have made up the following table, which shows that the calculation upon introgenous diet is over one-third too small:

	Water.	C.	H.	N.	O.
By respiration	330	248.8	. . .	7.	651.15
By perspiration	660	2.6	. . .	. . .	7.2
By urine	1700	9.8	3.3	15.8	11.1
By fæces	128	20.	3.	3.	12.
Total	2218	281.2	6.3	25 8	681.45

I have taken this expiration factor of N at 7 because it is so given, but this calculation is made for a man at rest, and in reality it should be 9.5, because this factor undoubtedly increases with man's labor.

I quote from Thompson's "Dietetics": "A man fed upon nitrogenous diet without vegetable food may not work as well in daily labor as when given a fair proportion of the latter, but, on the other hand, he is better fitted for sudden, arduous exertion than an exclusive vegetable feeder."

We all agree when we desire to increase a horse's spirit and activity we give him more oats and less hay, because of the more readily absorbed amount of nitrogen present.

"The northern Esquimo has absolutely no starchy or saccharine food, eats fat with his proteid diet, and is therefore enabled to acquire energy to resist extreme cold, and to take long and fatiguing journeys."

"The ancient Britons are known to have subsisted chiefly upon acorns, berries, roots, leaves, etc."

From the above, the truth of which I am convinced, I am forced to believe that not only is the vegetable diet of the tropics a mistake, but that what is needed by man to maintain himself with full energy in the tropics is to become more of a proteid feeder than at present.

What our soldier in the tropics needs is some way to preserve his proteid, to keep it as dead organic matter, and to have it prepared in such a way as to render it available for energy in his body. To reduce his proteid is simply to render him less efficient, and his present fresh meat rations should certainly be increased, for it is based upon a faulty calculation of nearly one-half.

I would ask, are not the effects attributed to various diets rather the effects of the toxines grown within the food and constantly absorbed in small amounts, similar to the gonorrheal rheumatism, rather than due to the absorption of properly digested food in too large an amount?

I submit that the expenditure of the increased amount of force required can, in a part at least, be explained in this way:

Water requires 772.55 foot pounds of work done to raise its temperature from 60 to 61 degrees Fahrenheit at the sea level. The human body is attuned to get a minimum of force exerted for vital reactions at about 77 degrees Fahrenheit, with the body at rest. Each degree of temperature, if the specific heat of water and the human body are reckoned the same, will require 772 foot pounds per pound of body. Now the human body with respiration and circulation of blood requires some 2800 foot tons per diem, and the minimum of expenditure is at 77 degrees air temperature to hold the body at 98; for each increase of one degree of air temperature is required an amount of heat equal to 772.55 foot pounds for each pound of the body; for the heat generating forces within the body generate enough heat when the air temperature is at 77, so that the balance between the heat given off and that generated leaves the body balanced at 98 degrees Fahrenheit.

If normal, the tidal air is 20 cubic inches, and 16 the number of respirations, we will have 320 cubic inches of air per minute. If 30 be the tidal air of labor, and 20 its respiration, we will

then have 600 cubic inches of air per minute for labor. At rest the human body gives off seven grammes of nitrogen in twenty-four hours. This is seven twenty-fourths of a gramme per hour at rest. If the nitrogen contents remain the same in expired air, of rest and labor, we will then have 320×60×10 equal to 192,000 cubic inches of air in ten hours for rest; and at labor 600 60×10 equal to 360,000 cubic inches of air in ten hours of labor. This will then give us 5.57 grammes of nitrogen excreted from the lung during the labor. We have 4.025 still left of the 7, making a total of 9.59 expended during the twenty-four hours, with the ten hours of labor.

I believe that this is an explanation of the universal demand made by the laboring man for a nitrogenous diet when under continuous labor. If the air temperature goes to 30 degrees, then for each pound of the body weight is added 772.55 foot pounds for each degree, if the specific heat of the body is the same as that of water. And if we take a man's weight at 150 pounds, this will give us 115,882 multiplied by 5 for 30 degrees as the increase which is added by heat alone of the atmosphere.

In the diseases caused by the fever-producing organisms, the toxines which result from their growth affect the involuntary muscles of the vessels, producing a tonic contraction; this results in the passage of less blood through the skin, and greater labor upon the central heart and skin-heart, because of narrowing of the calibre of the smaller vessels, and the greater difficulty under which the skin-heart beats. The heat continues to be generated within the body by the heart and breathing action, the skin allows less blood to pass; therefore, there is less heat interchange, and the balance is established at a higher point, and fever is the result. Emaciation, exhaustion, and loss of appetite follow in due course, just as they do in exhaustive labor of the voluntary muscular system, the greater labor producing a demand greater than the supply.

Dicrotism of the pulse-wave, the irregularity of the downward stroke of the sphygmograph are also evidences of the rhythmical beat of the vascular system. This action of the vascular system also readily explains the action of cold-water frictions in high bodily temperatures; the skin vessels are stimulated to

more or less nearly the normal heat, with the result that the heat interchange is greater, the temperature falls, and if the stimulation is such that its action continues the fever disappears. This action also explains the Schott treatment in hypertrophy with dilatation of the heart. I offer this not as the sole method by which fever may arise, but as one factor only.

My conclusion is that if any change is to be made in our diet for the tropics that it should be in the nature of increased allowance. What our soldier needs in the tropics is not a reduction of his rations, but that he shall have that food cared for with infinitely more care than it is at present, and that it shall be better prepared. His food is in good condition when it leaves the United States, but tropical conditions infect it with tropical germs with the first indication of carelessness, and the food is then condemned, whereas condemnation should rest on him who handled it carelessly.

I am fully aware that the body may create less heat at a higher atmospheric temperature, and that my argument is far from complete, and that the experimental data required to prove the position taken is far from what should be required. Nowhere can I find what the effect of labor is upon the excretion of nitrogen by the lung. I have been unable to find data available for energy required for digestion, and so on through the paper.

NIGHT COMMUNICATIONS IN FORTRESSES.

By Lieutenant W. B. SPENDER, R.A.

(*From the Proceedings of the Royal Artillery Institution.*)

TO write about such a subject may at first sight appear superfluous. It is a matter that has evidently been before the authorities and the result is seen everywhere in new telephone lines being laid down solely for "R. A. chain of command purposes" and very often quite independent of, and supplementary to those of the section commands. The new Siemens Halske Telephone Operator is undoubtedly an improvement on former instruments.

It is usual, I believe, for these R. A. telephone lines to converge from forts—often widely separated—to one point, the fire commander's post; and in very few cases, so far as I am aware, is there direct communication from one battery command to another.

How does this work out in action? A ship or fleet presumably hostile, is observed by one of the forts, and immediately the battery commander sends a telephone message to the fire commander. The fire commander may have as many as six or even more detached forts under his command; to each of them he has to send the information obtained, and his orders. No doubt he will begin with the work nearest to the supposed enemy, and afterwards to the others in rotation; but as one message to each fort can only be sent at the same time, there must be a delay of some minutes before the last battery receives it. With a fast moving target this might be fatal. In addition, any loss of time incurred at one fort means the same at the remainder; and even in the most perfect chain of command lines unavoidable accidents may occur—the bell refuse to ring, or the hearing be indistinct owing to a thunderstorm, etc. Also there is always the possibility of mistakes in the transmission of messages and in consequence waste of time, more especially if the fire commander is sending different orders to each battery commander under his command.

The necessity for speed is greater as regards the transmission of information than that of orders; the former is required

not only between fort and fort, but also between fort and ship, and the electric light and P.F. cells of the submarine miners. It would be a boon to communicate rapidly without notifying the enemy, if it were possibie; but for the present secrecy does not seem compatible with quickness.

In the issuing of orders, rapidity is perhaps not so important as to keep the enemy ignorant of your intentions; but with regard to information of the enemy's numbers and movements, you are, at the worst, simply informing him that you are aware of things which he already knows; and although it may be desired to conceal your knowledge from him, this does not seem of equal vital interest.

In some stations this want has apparently been felt already and megaphones are being experimented with as a method for more rapid intercommunication. The results on the whole appear to have been satisfactory, but, of course, only for distances not exceeding half a mile. This otherwise excellent instrument is considerably affected by climatic variations and by the commotion of a battle.

If the above are real difficulties means to escape them might be found in: —

1. Typewriting Telegraph (Stelje's patent).
2. Flare lights.
3. Signal rockets.

1. The first has the advantages of secrecy, and of being able to transmit simultaneously to all the batteries connected to the fire commander's post by telephone lines, an exact copy of the fire commander's orders. Although this typewriter does not need much of an expert to work slowly, it must take some time to send a message by this means, and of course it is only available where telephone lines are laid.

In the defense of a channel or a number of channels, which is usually the duty of the garrison artillery, there would probably be guard-ships and patrol boats furnished by the navy. Notice of an enemy obtained by these, should be sent to all the forts without delay. In this a rocket has the advantage over a typewriting telegraph, as also in the case of lookout and coast-guard stations on the coast to which lines are not yet laid.

2. Against the use of flare lights there are important argu-

ments. A flare light although very certain to be observed at considerable distances, also demonstrates with considerable accuracy its position and objects in its vicinity. Their use, therefore, would allow the enemy not only to locate a fort or ship, but might also afford him additional and valuable intelligence as to its size and armament. This fault is so fatal, as to preclude absolutely the use of flare lights, without some radical alterations in their construction.

3. Signal rockets on the other hand do not offer the above objections. If the spot of ignition is invisible, it is impossible to define it at all from the ascent of a rocket; even the firing of several rockets from the same place would not assist an enemy's gunner to range, and scarcely in laying for line, especially if the rockets are not all sent off in the same path.

A more important fault is that rockets are worthless in misty weather. This is serious, but unless some better system is available it should not prevent their being used when possible. Lamp signalling at night has both the above objections in an exaggerated degree. One can only hope that foggy nights may not be available when the enemy attacks, or that the mist may so oblige him to slacken speed, as to render the telephone capable of carrying out its work in sufficient time.

But, it may be asked, what information can be conveyed by a rocket?

1. That ships have been sighted, probably hostile.
2. The position of these ships.
3. All that has been ascertained as to enemy's numbers and the components of his fleet.

It would appear advisable to have at least two rockets for this purpose, of which the first might be an ordinary detonating rocket with a charge of 4 oz. of gun-cotton audible from 8 to 12 miles. The loud report would attract the attention of the look-out men at each fort, etc. This rocket might also be easily used to demonstrate the direction of the object sighted by means of different colored stars, but it would not appear advisable that these stars should be of the floating pattern, which were better, I think, reserved for the 2d rocket.

The second rocket is to describe and give the number of the enemy's ships. I fancy any fleet not exceeding 10 vessels

could be easily shown by a rocket of somewhat the following construction—a signal rocket with the motive charge already fixed, with a small bursting charge above it. The head to be of thin metal and kept empty when stored, but to have a cap piece made easily detachable with a bayonet joint. Before firing, the cap piece would be taken off, and a certain number of floating lights inserted and wads to keep them in position, as required, and the cap piece put on again. This rocket could be filled and fired in 10 seconds, would be seen for a radius of from four to eight miles on a clear night, and would cost from 2s. 6d. to 4s. each.

The number of floating lights would give the number of the ships; and their color would afford the description of them according to a recognized code. For example, the 2d rocket on bursting shows three green and two red lights—this would mean that a fleet of three torpedo craft and two cruisers had been sighted.

A look-out man on sighting any suspicious object whatever would send down to the battery commander or other officer detailed. As soon as he became convinced that it was a vessel, he would, if it were not showing the prearranged friendly signal, on his own authority fire off the 1st rocket according to the direction of the ship (*e.g.*, if in the N.E. one with red stars, if in N. one with white, if in N.W. one with green stars).

The officer on arrival would determine the class of vessels attacking and give instructions as to the filling of the 2d rocket.

It is probable that some system such as that suggested above, or a better one, has been contemplated, perhaps even arranged for in time of war; but it is doubtful if some practice is not necessary in time of peace.

So important is the discovery of ships—more especially torpedo craft—at night, that I believe one of the smaller continental powers, which has much to fear from attacks of this description, has specialists chosen for eyesight and trained in the use of night-glasses told off for this duty.

England's torpedo fleet is small in proportion to that of other European nations, and it is therefore advisable that garrison artillery should be peculiarly prepared to guard against their raids.

It may appear desirable to have trained specialists similar to gun-layers with some small extra duty pay, so that in time of war there would be at least three per work in order to take reliefs of not more than one hour each.

Practice could be obtained for these men in conjunction with the submarine miners and perhaps a money prize and badge could be awarded in those stations where combined manœuvres with the navy take place each year. At such times also communication between the guard-ships, patrol boats and the shore might be experimented on.

These men, except when actually employed as specialists would be available for manning the guns. If the 3 look-out men of each work were told off on mobilization to the same number on two guns, *e.g.*, as they are probably intelligent men, to number 4 on two guns, there would always be (even when one was employed on look-out duties) two men available for duty as No. 4.

Oculists agree in saying that the power of observation at night is greatly a matter of practice. From one's own knowledge on board ship one perceives how sailors, who have to be on watch can always see steamers, and also objects which are not lighted up, such as icebergs, long before the inexperienced passenger, no matter how the latter prides himself on the keenness of his eyesight. In the case of pilots this sense is developed to a marvellous degree of perfection.

To sum it up it is suggested that there should be :—

1. Gunners trained as look-out specialists sufficient for each fort and reliefs.

2. Rockets as a recognized means of communication between forts, warships, etc., at night.

3. Yearly combined practice with the navy, where possible, in the various means of passing information.

THE SOLDIER'S RATION IN THE TROPICS—ITS USE AND ITS ABUSE.

By LOUIS L. SEAMAN, M. D., New York, late Surgeon First U. S. V. Engineers.

(*From the Medical Record.*)

IN the great race for the survival of the fittest, wars are inevitable. Temporary checks may at times be brought about by the influences of civilization, and peace conferences may for the moment gratify the optimistic fancies of a visionary age. But the great truth remains that the natural termination of animal life is tragedy. In prehistoric and savage ages, this applied to the human as well as the lower animals. Civilization, in a measure, temporarily modified this through the influences of Church and State and the conquests of medicine; to nothing, however, so much as to the science of medicine, which, since before the time of Hippocrates, has been steadily fighting and conquering the most terrible devastating enemies of humanity. Medicine has done far more than militarism. It has conquered or mitigated plagues and pestilences, which in single epidemics have destroyed more lives than the total of the combined armies of the world. In one outbreak of cholera in China thirteen million victims succumbed to this disease. History commits no greater injustice than the mention of a thousand generals to one physician. But what great purpose have the conquests of science attained for our armies?

Europe, to-day, is one vast military camp, the resources of each country taxed to the utmost limit to support the great living plants for human destruction, the armies and the navies; and America is not far behind. Thousands of millions of dollars are annually expended by the civilized nations of the world in the maintenance of great military schools and arsenals, for the education of men in the art of war, and in the manufacture of machines of human destruction, while comparatively little is being done in the study of those equally important subjects, preventable diseases in armies and the preservation of the health of "the man behind the gun." We go blundering on, expending over a million of dollars a day in our effort to

destroy our human foes, while the more formidable adversary in the ranks, which history has shown to be five times more deadly than the bullets of an enemy, is left comparatively unheeded. Even the demand for the expenditure of a single million, or the cost of running our army for less than a day, for experimentation in the study of preventable diseases, and in the solution of dietary problems, so necessary for the preservation of the soldiers' health and energy, would be howled down by the short-sighted representatives of the people.

And what is the logical result of such mental myopia?

In the late Spanish-American War, fourteen men died of disdisease for every one that was killed by bullets.

Every death from preventable disease is an insult to the intelligence of the age. When it occurs in an army, it becomes a crime. The first responsibility of a government in times of war or peace, should be the proper care of its guardians. The state deprives the soldier of his liberty, prescribes his exercises, equipment, dress, and diet. It should, therefore, give him the best sanitation and the best medical supervision that the science of the age can devise. The morals of most wars are *cash*. From a moral then, as well as from an economical standpoint, the state should guard the soldier's health, for nothing is more costly in war than disease, and, after war, than the pension claims.

A personal experience in two of the latest tropical wars, and a study of the statistics of others, led the writer to the conviction that the cause most prominent in bringing about the conditions most favorable for the development of preventable disease in both these wars resulted from the misuse of food. And that this object-lesson may not be without its advantage to other lands is the *raison d'etre* of this paper.

Attributing to climate the diseases of the tropics is an error due to ignorance and custom. The vast majority of ailments accredited to climate have their origin in the use of improper foods, in over-feeding, or in the abuse of stimulants.

During the past two years, it has been my misfortune to see two great armies, one in my own southern country in Cuba and Porto Rico, and one in the Philippine Islands, largely invalided through errors in improperly subsisting the troops, and through

hyperalimentation. When whole regiments were suffering from stomach and intestinal catarrhs, diarrhœas, and kindred ailments (and I have seen over seventy-five per cent. of an entire command in this condition at one time), they were subsisted on a ration of rich meats, pork, beans, tomatoes, and other foods, that aggravated the diseases, crowded the hospital tents, and left the men weak and emaciated, so that their return to health was a prolonged struggle.

By this method a vicious circle was established, the diseases grew by what they fed upon—the utter unsuitableness of the ration creating the trouble and intensifying conditions which often resulted fatally, and which were always to the detriment of the soldier. Taps, and the last volley, were often the only reward many a poor soldier received for his patriotism.

From an extended observation of the commissary service of nearly every army of Europe, and those of China, Russia, and Japan, I believe that the ration served to the American soldier in the tropics was the richest, most expensive, and by reason of its richness the most unsuitable. The potential energy of this ration as represented in caloric units was 4448; that issued to the British soldier in a temperate climate is but 2800, while the caloric units in the ration of English prize-fighters, as given by Gillespie, of Edinburgh, is but 2200. It is an old saying that "The ration wins the battle." As furnished to the army, it was an excellent winter food, rich in nutritive and caloric power under a low temperature; but for a tropical land, the excess of carbon furnished by it to the lungs, over and above that which they could dispose of, imposed upon the liver and kidneys additional duties of elimination, producing congestions, fermentation and catarrhs, dyspepsia and lithæmia, glycosuria and phosphaturia, interfering with metabolism, and creating conditions favorable to bacterial development, together with almost the entire train of disease which crowded the army hospitals. In phosphaturia, especially, the nervous system is deprived of the salts necessary for its proper functions, which deprivation to the soldier not infrequently resulted in mental disturbances that in many instances ended in suicide or insanity. How little the climate was responsible for these cases may be inferred from the extreme rarity of sunstroke in the tropics.

The writer, after years' experience, has yet to see his first case of this nature there, although he has numerous friends, English, German, French, and American, residing between Bombay and Shanghai, who have lived in those lands for periods varying from twenty to forty years, and who have maintained excellent health throughout the entire time, simply by regulating their foods and exercise. They could have lived equally well in the Arctic zone by following similar precautions.

Dr. Ordronaux, a prominent surgeon of the American army in the War of the Rebellion (1861–64), said: "By a proper disposition of his diet, man lives as healthfully under the equator as under the pole. The East Indian with his rice and yams, and the Esquimau with his seal blubber and putrid fish, are both healthy enough in their respective climates, but let them once change residences without changing their diet, and what would be the consequences? The Esquimau would be attacked with putrid fever, and the West Indian would die of inanition.

"We perceive from this the absolute necessity of modifying all forms of diet in such a way as to accommodate them to the physiological requirements of the varying seasons. For habit is not acquirable as against the laws of chemical combination, and no man can become habituated to doing that with impunity which, being a violation of the physiological laws of his system, is by its frequent admonitions of pain notifying him of the evil about to overtake him."

"Habit is not acquirable against the laws of chemical combination." The soldier cannot disregard these laws, even under orders. An army regulation may provide a ration which violates nature's law, but no human power will permit a soldier to subsist on it and maintain his health.

The experiences of the British in Burmah and the West Indies, and the French in Algeria, forcibly illustrate this. In the first Burmese War, for six and a half months the troops were subsisted on salt ration almost exclusively, and forty-eight per cent. of them perished within ten months, principally of scorbutic dysentery, while in the regiment of Cameronians seven hundred out of nine hundred were invalided from the same cause in two months. In both instances these diseases were in-

duced by an almost exclusively salted diet, which not only irritated the intestines, but did not furnish sufficient nutriment to the system. It was observed in the West Indies, in the Leeward and Windward Command, that after an issue of salt ration five days in the week, the mortality was twenty per cent. When the issue was reduced to two days per week the mortality fell to two per cent. An excess of fresh meat also produces intestinal derangement. This was strikingly shown by Lamaran in the French campaign in Algeria, when the men ate excessively of captured mutton, and rapidly succumbed to intestinal disease. The same condition prevailed in the American army during the Civil War. It was noticed that immediately following a raid in the enemy's country and the capture of quantities of live stock, which was given to the men in excessive amounts, an epidemic of intestinal catarrh or dysentery invariably followed.

Simple catarrhal affections of the stomach and upper intestinal tract, not resolving rapidly, will lead, under an unsuitable dietary, to congestion of the liver, with all the dangers attached to such a state in a climate where the natural antiseptic of the intestine is of such paramount importance. The reduction of quantity in bile will lead to auto-intoxication and extension of the processes of inflammation, until the entire intestinal tube may be involved; and jaundice, duodenitis, enteritis, or colitis is developed, conditions which offer an open door for the entrance of micro-organisms.

The pathological features of the cases on which I was fortunate enough to hold autopsies, whether the causes of death had been pronounced intestinal catarrh, hepatitis, duodenitis, typhlitis, enteritis, enteric or typhoid fever, colitis, dysentery or diarrhœa associated with malaria, presented many similar characteristics. The liver was almost invariably congested. The mucous membrane of the intestine was pale, and covered with a thick, tenacious, adherent mucous; the mucosa was hypertrophied, often deeply congested and ulcerated; in two instances these ulcerations almost encircled the entire intestine. The toughness of the opaque secretions obliterated the intestinal glands, causing atrophy and thus interfering with absorption and metabolism. The solitary follicles stood out with promi-

nence, and the patches of Peyer were distinct, often with minute ulcerations on the surfaces, notwithstanding many of the cases in which they were found presented no characteristic typhoidal temperatures, and during life failed to respond to the Widal reaction.

From earliest history, experience has shown that, in time of war, disease was a far more deadly foe to an army than were the bullets of an enemy. In the war of the Crimea the French lost in killed twenty-one thousand, and from disease one hundred thousand, or about one from bullets and wounds to five from disease. The proportion of losses of the British from disease in that campaign ran a little higher—six having died from disease for every fatality from bullets and wounds.

In the American war with Mexico nearly the same proportions were maintained—five fatalities being ascribed to disease for every one resulting from bullets or wounds. So, too, in the war of the American Rebellion, lasting four years, the rate of five to one remained unchanged. In round numbers five hundred thousand perished in hospital wards from the more fatal enemy disease, and one hundred and one thousand fell on the field or died as the result of wounds.

But it has been reserved for the Spanish-American War in the tropics to cause a blush of indignation at the apathy that permitted preventable diseases to play such havoc with its army. In a campaign, the actual hostilities of which lasted from July 1st to August 18th, about six weeks, the mortality from bullets and wounds was two hundred and sixty-eight, while that from disease reached the appalling number of thirty-eight hundred and sixty-two, or about fourteen to one. With proper subsistence and sanitation, these proportions for such a short service, and with men recruited after rigid examination and accepted on account of their splendid physical development and health, should have been reversed.

In the limited scope of this paper it is not purposed to discuss the various ration tables of the armies of the world, or the relative merits of each article of diet. This may be found in the elaborate works of Parkes, Yeo, Carpenter, Ranke, Atwater, Rattray, Eijkman, Mourson, Cohnheim, Notter and Frith, Church, Duncan, and others who are authorities on foods. But

I wish to call attention to the dangers in tropical environment resulting from overtaxing the digestive system of healthy men from temperate climes, by the excessive use of meats and fats, which require more oxygen in their metabolism, and thereby create more heat through the activity imposed upon the internal organs in their digestion and elimination.

In addition to tissue repair the ingestion of food is to accomplish two results—the development of body heat, and bodily motion or energy. The mutual relation of income and expenditure has been calculated to a fine degree of exactitude. Ranke's well-known tables show that one-sixth of the total income of food is expended in mechanical force, and five-sixths in producing heat. Carpenter on this question (the lesser production of body heat where the external temperature is high, as in the tropics) says; "Every change in the organic components of the body in which their elements enter into new combinations with oxygen must be a source of the development of heat, and as a considerable portion of the carbon dioxide and water exhaled in respiration is formed within the body by the metamorphosis of its own tissues, and since the metamorphosis is promoted by the active exercise of the nerve-muscular system, it follows that in animals whose habits are peculiarly active, living in climates in which the surrounding temperature is high enough to prevent any cooling influence, the combustive process thus maintained may be adequate for the maintenance of the temperature of the body at its own normal standard. Hence, it appears that we do not want to provide for the heat of the body in the tropics, but only for the work done when there is a peculiarly active life."

Carpenter says: "The general experience of inhabitants of warm climates is in favor of a diet chiefly or entirely vegetable, inasmuch as such diet affords an adequate supply of albuminates in combination with the other classes of foods without affording more fuel than the system requires."

These statements have an especial interest when considered in conjunction with the highly nitrogenous and heat-producing elements of the United States field ration, which contains nitrogen 18.12 gm., protein 113.26 gm., fats 218.26 gm., and carbohydrates 489.08 gm., and represent in caloric units 4448.

The average of four dietaries of natives in the tropics when at hard labor (of the West Indies by Maurel, the Abyssinian soldier by Labicque, the coolie in British India by Church, and the Malay by Eijkmann, brought up for comparison to the common standard of body weight, 145 lbs., of the European by Munson, in an admirable essay on this subject) was found to contain of nitrogen 12.18 gm., protein 76.18 gm., fats 40 gm., carbohydrates 560.01 gm. and represented in caloric units 2900.

Compared with the above average the United States ration represents an excess of nitrogen 5.94 gm., protein 36.08 gm., fats 178.26 gm., and of caloric units of 1548, while in the principal and easiest energy-liberating element, the carbohydrates, there is a deficiency of 80.93 gm.

Life in the tropics is found to produce the following conditions:

1. Increased body temperature, amounting on an average to over 0.5° F.

2. Loss of body weight due to imperfect oxygenation and the destructive effect of continued heat, amounting to over eight per cent. in the first year.

3. Diminished cardiac action due to low arterial tension and the relaxed state of the capillaries, resulting from the loss of fluids by increased perspiration.

4. Lower pulse rate amounting to three per cent.

5. Reduced pulmonary endosmosis on account of the rarefaction of the atmosphere and the low arterial pressure.

6. Diminished urinary secretion owing to increased perspiration, amounting to thirty-three per cent.; and a higher specific gravity of the blood in consequence.

7. Diminished excretion of urea by the kidneys amounting to ten per cent.

8. Increased secretory activity of the liver caused by the irritation resulting from the loss of fluids and relaxation of the capillaries, and the decreased elimination of urea by the kidneys. This increased activity frequently amounts to congestion, which, if continued, soon becomes chronic with danger of impaired function.

9. Diminished secretion of saliva, mucus, gastric and pan-

creatic juice, and bile, in consequence of increased perspiration and the higher specific gravity of the circulating fluids.

10. Dependent on these are dryness of the throat and fauces, exaggerated thirst, weakness of appetite, and impaired digestion.

In order to cope successfully with these conditions it is necessary to relieve the digestive apparatus of all superfluous labor. The food should be well cooked to prevent alimentary fermentation, and should contain as little of the albuminoid principles taken from meats and fats as is compatible with the repair of the system. Meat, in the fresh state, being the most perishable of all foods, should, for campaign requirements, be replaced as largely as possible with dried and smoked varieties. The creosote in smoked beef being a gastric stimulant and intestinal disinfectant, when proneness to diarrhœa exists, is a decided advantage. Salt and tinned meat is objectionable. The nutritive value of salted meat is reduced over one-third owing to the solution of the albuminates by the chloride of sodium, and is rendered less digestible through the hardening of its muscular fibre ; and tinned meats produce after continued use impairment of digestion. On the contrary, smoked meats are not prone to decay, they retain their nutritive qualities, are easily digested, concentrated, and far more portable for field use.

The energy of the system should be derived as largely as possible from easily digested carbohydrates, instead of from meats and fats. The metabolism of both nitrogen and fat produces much unnecessary heat, through the splitting up of the proteids and the emulsification of the fats. Carbon necessary for nutrition can be provided either in the form of fats or carbohydrates.

Fats are more suitable for tissue growth and repair than carbohydrates alone. A large proportion of fat, however, is as a rule not well tolerated by the digestive organs for continued use, except under conditions of climate like that of the Arctic regions.

Dujardin-Beaumetz regards the average daily allowance of fats as 55 gm. The great purpose of fat in the food is to diminish albuminous metabolism, and it is, therefore, regarded as an albumen-sparing food.

As stated by Baumer, " If flesh alone be given, large quanti-

ties are required in order that nutrition and waste may balance one another, but if fat be added the demand for flesh is less."

External temperature influences the metabolism of the hydrocarbon and therefore the amount of carbon excreted. The lower the temperature, as long as that of the body itself is maintained, the greater the metabolism of non-nitrogenous foods and the greater the amount of carbon discharged from the body. In higher temperatures the reverse conditions prevail—there is less metabolism and less carbonic acid exhaled; therefore, excepting for the actual necessities of the system, fats should be avoided in hot climates.

Natural appetite or instinct prompted the avoidance of fatty food by the troops in Porto Rico, Cuba, and the Philippines. Their aversion to bacon, the best form in which fat can be supplied for campaign use, led practically to a waste of this article, except as it was used for culinary purposes.

Carbohydrates, while having much in common with fats, have additional advantages. They serve the same purpose of checking albuminous waste, and, like the fats, they are resolved by combustion within the body into carbonic acid and water. They also yield heat and energy, but do not enter into the structure of the tissues. All carbohydrates are converted into glucose before absorption, and in this form are more readily metabolized than fats or albuminates. Bauer showed that carbohydrates, even when administered in great excess, are almost completely destroyed within the body. He maintains that, owing to the facility with which they are metabolized, they protect other foods from destruction. Owing to the ease with which they are oxidized (as they contain hydrogen and oxygen in the proportions to form water), the carbon is easily liberated for the purposes of energy, and with less production of internal heat. For this reason they are our most valuable factor for the production of energy in the tropics, as they impose less labor on the organs of digestion.

Of the cereals which must supply a portion of the carbohydrates, those indigenous to the tropics are better than those grown in temperate zones, as they contain less nitrogen. Of these maize, rice, and the native lentil, when well cooked, are preferable. In a mixed diet in which fat and albumen are sup-

plied from other sources, rice, on account of the easy digestibility of its starchy components, is especially valuable.

Napoleon, commenting on the terrible trials of the Moscow campaign, mentions that of all his army the Italian troops withstood the hardships best. They were subsisted on a ration made up almost exclusively of vegetables and cereals. Leonidas and his little Spartan band defended the passes of Thermopylæ on a diet of lentils. The winner of the late international race at the Olmpyian games at Marathon trained on the same food, the lentil. All were carbohydrate fed.

The advantages of sugar are only now beginning to be appreciated. When energy is to be liberated rapidly with the least tax upon the digestive system, sugar, an almost pure soluble carbohydrate, would seem to be the ideal food for the purpose.

Nature's prodigal supply of sugar-cane, and low heat producing but nourishing fruits in tropic lands, would seem to indicate their peculiar adaptability for the particular requirements of inhabitants of hot zones.

The bee and the colibri, whose marvellous endurance is the wonder of the physiologist and philosopher, derive their power almost exclusively from sugar. Everyone who has seen the humming bird suspended in space for hours, with wings moving with lightning rapidity, flying from flower to flower, drawing from the chalice the sweetened dew, must have wondered at the marvellous conservation and correlation of force that enabled it to perform such sustained effort; the motive power was sugar.

In the Philippines the cavalry horses imported from America became emaciated and refused to eat, until it was discovered that molasses or sweetened water sprinkled on the coarse grass or hay made it palatable. When fed to them in this form they flourished and grew sleek and fat. A soluble pure carbohydrate, sugar, had supplied the deficiency. Among the troops in Porto Rico and the Philippines whose appetites and digestions had become impaired, there was a craving for candies and sweets which was astonishing, all due to the same physiological reason, the instinctive desire for an easily metabolized, energy-producing food which these articles supplied. Cyclists, on long *tours de force*, have demonstrated what can be accomplished on a ration

containing little else than carbohydrates. In these record-breaking trials, extending over periods of many days, the expenditure of energy is nearly continuous. The intervals for rest or sleep are very short, and exhaustion can be counterbalanced only by the most easily metabolized diet. Experiments with the ergostat have demonstrated, by the use of sugar, the rapid liberation of energy following a state of extreme exhaustion. Sugar relieved fatigue more rapidly than other foods.

The excessive use of sugar, however, with a mixed diet, interferes with the digestive of proteids, in diminishing the secretion of hydrochloric acid; but, when the supply of meat and fats is restricted, hydrochloric acid is not required to such an extent, and consequently sugar can be used more liberally. In comparison with other foods, sugar could be regarded as a refined fuel for the system, just as alcohol would be if used for fuel for an engine. In their easy metabolism they liberate energy, and in their perfect combustion they leave no ash or waste products.

Tea and coffee contain the identical alkaloids, theine and caffeine; but for campaign purposes tea has many advantages. When compressed in cakes it is concentrated and easy of transportation. Two minutes are sufficient for its infusion, and if taken in a weak solution, as it always should be, the large quantity of palatable sterilized water introduced into the system forms not only a refreshing beverage but stimulates the processes of digestion, and increases remarkably the soldier's power of enduring great fatigue in hot climates.

Curry is a valuable addition to the usual condiments (pepper, salt, and vinegar). It aids digestion in stimulating intestinal secretion, and acts as an anti-fermentative.

A liberal ration for the soldier in the tropics could be supplied in the following articles:

Fresh meat 10 oz. or its equivalent in dried and smoked beef, bacon 2 oz., flour 12 oz., rice, lentils, or maize 4 oz., succulent and green vegetables 14 oz., dried fruits 2 oz., sugar with chocolate 4 oz., tea and condiments including curry, salt, pepper, and vinegar 3 oz.

This allowance represents about 40 grains of protein, 15 of nitrogen, 83 of fat, and 540 of carbohydrates, and equals 3300

caloric units, or more by 400 than the average given in the dietary quoted by Munson for men at hard labor in the tropics.

From this list an extremely light, portable travel ration could be selected. By doubling the quantity of sugar, the bulky carbohydrates (the vegetables, fruits, and cereals) could be omitted, and the energy-supplying quality of the ration maintained at almost its full standard.

If supplemented by an occasional indulgence in fruits and vegetables to be found *en route*, to supply vegetable salts and acids, an army could subsist for months under severe physical strain, and maintain its health and vigor. The pea sausage, as used by Kitchener in his campaign from Khartoum to Omdurman, has amply demonstrated this.

A consideration of this topic by the International Congress may not seem pertinent to its members; but just now, with the allied armies of Christendom gathered in a foreign clime for a common purpose, with the Caucasian arrayed against the yellow races—the Occident against the Orient, the temperate zone against the tropic, and the prestige or preservation of modern civilization the tremendous issue—the study of these problems, on the successful solution of which victory or defeat may depend, becomes of paramount importance.

BEANS, PEAS, AND OTHER LEGUMES AS FOOD.

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INTRODUCTION.

THE word legume is used by botanists to denote the one-celled two-valved seed pod, containing one or more seeds, borne by plants of the botanical order Leguminosæ. The most common representatives of this family which are used as food are the various kinds of beans and peas. In common usage the term is applied to the plants themselves, which are hence called leguminous plants or legumes. The term pulse is also sometimes applied to this class of plants. The papilionaceous or butterfly-shaped flowers and the pendent pods of the pea and bean are familiar in every garden, while the ripened seeds of the pea, bean, lentil, and peanut are among the standard food stuffs offered in our markets. Taking the world over, the legumes are, next to the cereals, the most valuable and the most extensively used among vegetable foods. The seeds are eaten green, either alone or with the pod, as in the case of string or snap beans and edible podded peas, and also in the fully ripened state, as split pea, dried bean, lentil, and peanut. Most species of the pea and bean have been greatly improved by the gardeners' art.

GEOGRAPHICAL DISTRIBUTION.

Representatives of the legume family are found in all climates and countries. The pea and bean grow rapidly, three to four months being sufficient to bring most varieties to maturity, and consequently they can be grown in the short summers of far northern lands, the pea, the most hardy of them, at least as far as 67° north latitude; and, as they also stand high temperatures, they are all largely cultivated in tropical and subtropical regions. The pea is the favorite legume of middle and northern Europe, while in the Mediterranean countries the bean is grown more generally than the pea. In nearly all sections of our own country both the pea and bean are grown extensively,

and are even exported. Peanuts of a superior quality are cultivated in our Southern States. So far as can be learned, the lentil is at present grown in this country only to a small extent in the southwestern portion of the United States.

The Bean.—This valuable legume is known to have been cultivated by the Egyptians, the Greeks, and the Romans. The Romans used the broad bean (*Vicia faba*) in voting and in certain ceremonies. Early voyagers to the Western Continent speak of beans and peas as being cultivated by the Indians in different parts of North and South America, and we know that the Algonquins had one and perhaps two varieties of pole beans. The Indian name for the bean means "to wind about." Champlain, in 1604, describes the planting of what he calls the "Brazilian bean" in the region of the Kennebec. He says it grew 5 to 6 feet high and wound around the corn. It is certain that before 1600 A. D. beans were cultivated as far north as the St. Lawrence, and they were recognized by travellers as "proper to the country." Bean flour is spoken of as in use among the Aztecs. Beans are now widely distributed, one or more varieties being grown in all temperate, tropical, and subtropical countries.

The main species of beans are briefly discussed below.

Broad or Windsor Bean (*Vicia faba*).—This is the "bean of history," or that which was earliest cultivated. This bean grows erect, about 2½ feet high, has a square, reddish stem, and the leaves are made up of oval leaflets. The pods are broad, thicker at the end, and generally curved and pendent, containing thickish, bulging seeds. Several varieties are grown in Europe, both for fodder and for human food, but it does not continue as long in bearing as other beans. It is said to be more generally eaten there by the poor than by the wealthy, but, as it has a distinct and agreeable flavor of its own, quite different from the kidney bean, it should be better known among us. It is gathered when full grown, but unripe, as it is then best flavored. The Broad Windsor is perhaps the best known of the cultivated varieties, but it is less successfully grown in the United States than in Europe, the climate being apparently unsuited to its best development. It is imported to some extent in exchange for varieties grown here.

Kidney Bean (*Phaseolus vulgaris*).—This species, with its numerous varieties, comprises all beans ordinarily used among us except the Lima bean. It is a native of a warm climate, probably of South America, and was introduced into Europe in the sixteenth century. It was not known to the ancients. It has since become very important, chiefly because varieties of it are easily produced by the gardener and the quality thus improved by cultivation. What is called the "keel" in papilionaceous flowers is reduced in the kidney bean to two small blades which do not adhere and cover the pistil, so that cross fertilization with different varieties is easily brought about. It is naturally a climber, but dwarf varieties have been developed which we call bush beans, which are used both as string or snap beans and as dried beans. This bean grows rapidly, flowering and seeding early. It has large, rough leaves, made up of three leaflets, and the butterfly-shaped blossoms, in clusters of from two to eight, start at the axils of the leaves. The pods and seeds are variously shaped and colored. The kidney beans may be divided into two groups—tough podded and edible podded, there being both bush and pole varieties of each group. A great number of varieties have been developed, each locality having its own favorites, and the tendency of growers to rename standard varieties or those which have developed only unimportant differences tends to confuse the nomenclature. The many "wax" beans belong to this species. Most of the "shell" beans which are eaten before fully ripe are of the pole varieties. The prejudice against beans that grow dark in cooking is unfortunate, since many of them are of fine quality and full flavored.

Lima Bean (*Phaseolus lunatus*). — This bean is of South American origin, a tall climber, bearing a very flat, broad pod, with short, flat seeds, slightly kidney-shaped, one of the halves nearly always larger than the other and wrinkled or fluted. The Lima bean is of excellent quality and a favorite shell bean, both green and ripe, especially in the United States. There is also a cultural variety of bushy habit.

Scarlet Runner (*Phaseolus multiflorus*).—This species, familiar as an ornamental climber but seldom used as food in the United States, is considerably used for that purpose in Europe,

especially in England, some varieties being often preferred both as string and green shell beans to the kidney bean. They are, however, inferior to other beans when dry. It seems strange that this handsome climber, of vigorous and rapid growth, should be so little known as a food plant. It is used while young and tender in the form of string bean. It bears better if the growing points are pinched off.

Frijole (*Phaseolus spp*).—Another species which should be noted as being of local rather than general importance is the frijole (*Phaseolus* spp.) of Mexico and our Southwestern Territories, a small, flat bean frequently of a reddish brown or light tan color. Various other colors are also found. It is, next to maize, the staple food in those regions. It is largely used also as a green or snap bean. Either green or dry it is an almost daily food with the Mexicans or natives of Spanish-Indian descent.

It would seem that the dry frijole might well be used farther north. Several varieties that have been tried are very good both in soup and as a vegetable.

Cowpea (*Vigna catjang*).—The cowpea belongs to the bean family; but it is the "field pea" of the Southern States. There are several varieties—the "red" and "black" varieties, the round "lady" peas, the large "black-eye" and "purple-eye," and the variously mottled and speckled "whippoorwill" peas, besides many others. There are both trailing and bush varieties. The plant bears a leaf with three leaflets and long pods growing in pairs on a long stem. The cowpea has been grown for at least one hundred and fifty years in our Southern States, the seed having been brought from India or China. It is grown both as a forage plant and for human food, but mainly as a fertilizer for the soil (green manure). Considerable quantities of the cowpea are consumed during the season, being gathered when the pods begin to change color and before they become dry. For winter use the dry peas are cooked like other dried beans and have a very agreeable flavor.

The cowpea requires a longer season than the kidney bean and will seldom, if ever, mature in the climate of New England. But as a dry bean it might well be introduced into our Northern markets on account of its distinctive and agreeable flavor.

Soy Bean (*Glycine hispida*).—"The soy bean is an erect annual plant, with branching hairy stems, trifoliate, more or less hairy leaves, rather inconspicuous pale lilac or violet colored flowers, and broad two to five seeded pods covered, like the stem, with stiff reddish hairs. The seeds vary in color from whitish and yellowish to green, brown, and black; and in shape from spherical to elliptical and more or less compressed. Under favorable conditions the plant may reach a height of four feet or more."*

This leguminous plant, probably native in China, is the most important legume of China and Japan. Its remarkable high percentage of protein (34 per cent.) and fat (17 per cent.) attracted the attention of Europeans some twenty-five years ago. Since that time it has been cultivated to some extent, both in Europe and America, chiefly as a forage and soiling crop. In the Orient this bean and the various food products made from it are so largely consumed that it is perhaps the most important food plant next to rice. The soy bean is eaten to a small extent boiled like other beans, but in China and Japan it is elaborated into a variety of products, all of which have a high percentage of protein, and when eaten in connection with the staple food, rice, which is so deficient in that constituent, helps to make a well-balanced dietary. Some one of these products is eaten at perhaps every meal, and by rich and poor alike, especially in the interior of these countries, where sea food is not obtainable. One of the most important of these preparations is shoyu, and it is the only one that has been introduced to any extent into other countries, where it is known as soy sauce. To make it, a mixture of the cooked beans with roasted wheat flour and salt is fermented for some years in casks with a special ferment. The result is a thick brown liquid having a pungent and agreeable taste.

There are also several varieties of bean cheese or similar products made from this legume which are very important foods. These are natto, miso, and tofu. Natto is made from soy beans that have been boiled for several hours until very soft, small portions of the still hot mass being then wrapped securely in bundles of straw and placed in a heated, tightly closed cellar for

* U. S. Dept. Agr., Farmers' Bul. 58.

twenty-four hours. Bacteria, probably from the air or the straw, work in the mass, producing an agreeable change in its taste.

For tofu, the soy bean, after soaking and crushing, is boiled in considerable water and filtered through cloth. To the resulting milky fluid 2 per cent. of concentrated sea brine is added, which, probably by virtue of the calcium and magnesium salts present, precipitates the plant casein, which is then pressed into little snow-white tablets. It is made fresh every day. Tofu is sometimes cooked in peanut oil before it is eaten. In natto and miso the action of minute organisms plays an important part. In tofu there is no such action. The composition of a number of these products is as follows:

COMPOSITION OF FOOD PRODUCTS MADE FROM SOY BEANS.

Soy-bean food products.	Water.	Protein.	Fat.	Nitrogen free extract.	Fibre.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent*	*Per cent.*	*Per cent.*
Fresh tofu	89.00	5.00	3.40	2.10	.....	0.50
Natto	15.32	41.42	23.65	15.05	1.48	3.08
White miso	50.70	5.70	24.40		12.60	6.60
Red miso	50.40	10.08	18.77		8.25	12.50
Swiss miso	12.53	26.43	13.91	19.54	1.41	26.18
Shoyu	63.29	8.31	.....	5.10	.....	19.45
Do	67.42	7.37	.....	4.06	.....	17.47

Lablab Bean (Dolichos lablab) and other Uncommon Varieties.—There are several kinds of beans which, though articles of diet in Oriental countries, are used only to a limited extent in the United States, usually by Chinese or other residents of foreign birth or extraction. Lablab beans (*Dolichos lablab*); asparagus bean (*Dolichos sesquipedalis*), and mungo bean (*Phaseolus mungo*), may be mentioned. The green pods of the asparagus bean are largely used as a snap bean. The pods are long, containing 10 to 16 seeds, more slender than string beans and slightly ridged along the middle of the two valves. Under the name of "tou kok" this vegetable is cultivated by the Chinese in some regions of California and is said to be finding favor with the white residents and is considered a valuable variety of snap bean.

Locust Bean (Ceratonia siliqua).—There is still another bean which may be said to be among our local food products since the pod is regularly found in a dried state on the confec-

tioners' stands and sold under the name of St. John's bread. It is the carob or locust bean (*Ceratonia siliqua*), grown on the shores of the Mediterranean Sea as food for cattle. It is also eaten to a considerable extent by the poorer people. The ripe seeds are surrounded by a sweet mucilaginous pulp of agreeable flavor. When dried the sugar content is as high as 50 per cent. Similarly, portions of the pods of the so-called honey locust (*Gleditschia triacanthos*) are also eaten to a limited extent in this country.

The Pea.—The pea was originally from a more northern clime than was the bean, and it has probably been cultivated from very early times, although it does not seem to have been known to the Greeks and Romans. It appeared in Europe in the Middle Ages, but it was not cultivated in England even in the time of Elizabeth. Fuller says that peas were brought from Holland and were accounted "fit dainties for ladies, they came so far and cost so dear." From the market gardener's point of view, the pea is the most important of the legumes. In this country and in Europe great quantities are consumed in the green or unripe state, and in Europe the dried or "split" pea is as largely used as the dry bean; with us it is less popular.

Field Pea (*Pisum arvense*).—The field pea has few varieties. It has in general colored blossoms and the seeds are more or less spotted with brown. The field pea is chiefly used for fodder; but one variety, the Canadian field pea, is considerably used as a table vegetable. When two-thirds grown it is said to be delicate and well flavored, and it has the advantage of a longer season than the garden pea. As a dry pea it is inferior, as it does not cook soft.

Garden Pea (*Pisum sativum*). — The garden pea has many varieties, but they are kept only by great care, as they easily revert to the original type. The cultivated pea has slender, hollow stems bearing compound leaves and terminating in tendrils which attach to any near object. The flowers, generally white, are produced in the axils of the leaves and are followed by pods containing a number of green seeds which are light green when unripe and green or white when ripe.

The garden pea is divided into tough podded or shelling peas, the only kind in general use in this country, and the

edible podded or sugar peas. Both kinds may be tall, dwarf, and half dwarf.

Shelling peas are again divided into the smooth or round seeded and the wrinkled kinds. Many varieties of both have been developed by the gardener. There is indeed a useless multiplication of names and varieties.

The edible-podded peas deserve to be better known among us. Many varieties are successfully cultivated in Europe, but here as yet they are grown chiefly by amateurs and are hardly in the market. The seed is furnished, however, by most growers. This pea has a very tender pod, the ordinary parchment-like lining being much attenuated. The pod is thicker and more fleshy than the pod of the shelling pea. It is gathered when the pea is just forming and used, pod and all, exactly like string beans. Some varieties tested were found to be excellent in flavor and texture.

Chick-Pea or Gram (*Cicer arietinum*).—A shelling pea, practically unknown here, is the chick-pea (*Cicer arietinum*), the garbanzos of Spanish cookery, or the gram of India. It is largely cultivated in southern Europe, in Spanish America, and many parts of the East, especially British India, whence it is exported. It is a stiff, upright plant, covered with hairs and bearing inflated pods containing a few curiously shaped seeds; the two lobes distinctly marked and the germinal point very prominent.

These peas are eaten boiled, but more commonly roasted. This roasted pea seems to have been much in use in Roman times, the phrase *fricti ciceris emptor*, "buyer of roasted chick-peas," meaning in conversation a poor fellow.

The Lentil (*Lens esculenta*).—The lentil is a small branching plant with delicate pea-like leaves. The small white flowers growing in pairs are followed by flat pods, each containing two very flat round seeds, convex on both sides. Unlike the pea and bean, the lentil is eaten only when fully ripe. The brown or reddish lentil is smaller than the yellow, but of more delicate flavor.

The lentil is one of the most ancient of food plants, probably one of the first to be brought under cultivation by man. It has been grown from early times in Asia and in the Mediter-

ranean countries. The reddish Egyptian lentil probably furnished the "red pottage" of Esau. In Europe this legume is far less grown than the pea and bean, partly because its yield of seed and straw is less; therefore the market is partially supplied from Egypt. The lentil, according to analysis, is one of the most nutritious of all the legumes, but its flavor is pronounced and to some persons not as agreeable as that of the pea and bean. It has sometimes been claimed that indigestion and other bad effects followed the eating of lentils, but this impression is known in some cases to be traceable to the use of certain poisonous vetches, whose seed much resembles the lentil. There is every reason to consider the lentil a wholesome food. Until recent years the lentil was little known in the United States, but with the growth of the foreign population its use has steadily increased. The lentils found in our markets are all imported, but the culture of this legume with European seeds is being tried in our Southwestern Territories and elsewhere. There is already grown in New Mexico and Arizona, as well as in Mexico, a small variety of lentil, the seed of which was doubtless brought from Spain centuries ago by the ancestors of the present mixed race living there. The sandy soil of moderate fertility seems adapted to it; it has become acclimated, is hardy and prolific.

The Peanut (*Arachis hypogæa*).—The peanut is so different in appearance from the bean and pea, and is put to such different uses that it is seldom thought of as a legume, but a study of the growing plant immediately shows the resemblance. Here we see the same straggling, more or less trailing annual, with characteristic leaves, and the butterfly-shaped blossom, whose ovary develops into a seed pod. The manner of growth from this point is very peculiar; as the flower withers the stalk or spike of the ovary rapidly lengthens and pushes into the ground, so that the pod is matured beneath the surface, but if the spike is prevented from doing this it soon withers. Other names for this plant are the earth nut, ground nut, ground pea, goober, and pindar. Where the peanut originally grew is uncertain. It is now widely distributed in tropical and subtropical countries, Africa and our own Southern States producing most of the crop.

NUTRITIVE VALUE OF THE LEGUMES.

The different kinds of legumes are so similar in their general character, nutritive constituents, and digestibility that in these regards they may be treated together. Even in an immature state, as green peas and beans, they are, as regards composition, equal or superior in nutritive value to other green vegetables, and the ripened seed shows by analysis a very remarkable contrast to most of the matured vegetable foods, as the potato and other tubers, and even to the best cereals, as wheat. This superiority lies in the large amount of nitrogen in the form of protein that they contain. Another characteristic of the legumes brought out by analysis is the large percentage of mineral matter in them, the excess being chiefly in lime and potassium salts. In some instances they contain a large amount of fat; for instance, 17 per cent in the soy bean and 50 per cent in the peanut.

A comparison of some of the more common fresh and dried legumes with other food materials is shown in the table on page 106.

Fresh string beans, sugar peas, and shelled peas, like other fresh, succulent vegetables, contain considerable water, which, with the materials dissolved in it, forms the plant juice. They somewhat resemble cabbage in percentage composition. Fresh shelled beans, peas, and cowpeas contain a fairly large amount of protein or nitrogenous material, the nutrient which serves to build and repair body tissue as well as to furnish energy. They also contain considerable carbohydrates and small amounts of fat, both these classes of nutrients serving to supply the body with energy. The amount of ash or mineral matter in the legumes varies in amount. It doubtless serves the same purpose in the body as mineral matter found in other food materials. The canned legumes, which are simply cooked foods sterilized and kept in such a way that they can not ferment, resemble in composition the same materials uncooked. The dried legumes contain some water, though to the eye they seem to be perfectly dry. They contain a high percentage of protein, in this respect surpassing the other seeds commonly used as food, such as wheat. They approach animal foods as regards protein and total nutritive value, most of the legumes containing carbohy-

COMPOSITION OF FRESH AND DRIED LEGUMES COMPARED WITH THAT OF OTHER FOODS.

MATERIAL.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
Fresh legumes:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
String beans	89.2	2.3	0.3	7.4	0.8	195
Whole pods of *Dolichos sesquipedalis*	79.9	4.5	.5	13.9	1.2	365
Sugar peas or string peas	81.8	3.4	.4	13.7	.7	335
Shelled kidney beans	58.9	9.4	.6	29.1	2.0	740
Shelled Lima beans	68.5	7.1	.7	22.0	1.7	570
Shelled peas	74.6	7.0	.5	16.9	1.0	465
Shelled cowpeas	65.9	9.4	.6	22.7	1.4	620
Canned string beans	93.7	1.1	.1	3.8	1.3	95
Canned Lima beans	79.5	4.0	.3	14 6	1.6	360
Canned kidney beans	72.7	7.0	.2	18.5	1.6	480
Canned peas	85.3	3.6	.2	9.8	1.1	255
Canned baked beans	68.9	6.9	2.5	19.6	2.1	600
Peanut butter	2.1	29.3	46.5	17.1	5.0	2825
Dried legumes:						
Lima beans	10.4	18.1	1.5	65.9	4.1	1625
Navy beans	12.6	22.5	1.8	59.6	3.5	1605
Frijoles	7.5	21.9	1.3	65.1	4.2	1605
Lentils	8.4	25.7	1.0	59.2	5.7	1620
Dried peas	9.5	24.6	1.0	62.0	2.9	1655
Cowpeas	13.0	21.4	1.4	60.8	3.4	1590
Soy beans	10.8	34.0	16.8	33.7	4.7	1970
Chick-pea *a*	14.8	12.4	6.7	63.3	2.8	1690
Peanuts	9.2	25.8	38.6	24.4	2.0	2560
St. John's bread (carob bean) *a*	15.0	5.9	1.3	75.3	2.5	1565
Potatoes	78.3	2.2	.1	18.4	1.0	385
Cabbage	91.5	1.6	.3	5.6	1.0	145
Tomatoes	94.3	.9	.4	3.9	.5	105
Rolled oats	7.7	16.7	7.3	66.2	2.1	1850
Wheat breakfast foods	9.6	12.1	1.8	75.2	1.3	1700
Spring-wheat flour	12.3	11.7	1.1	74.5	.4	1650
Winter-wheat flour	11.9	10.7	1.0	75.8	.6	1650
Lean beef	70.0	21.3	7.9	.....	1.1	730
Dried beef	54.3	30.0	6.5	.4	9.1	840
Milk	87.0	3.3	4.4	5.0	.7	325
Cheese	34.2	25.9	33.7	2.4	3.8	1950
Eggs	73.7	14.8	10.5	.....	1.0	720

a European analysis.

drates in place of the fat found in animal foods. Fats and carbohydrates, however, serve the same purpose in the body, although the fat yields two and one-fourth times as much energy per pound as carbohydrates.

Nitrogenous Constituents.—Vegetable foods are nearly all rich in starch and other carbohydrates, which supply an abundance of carbon to the system; but they contain, in general, comparatively little nitrogen, an element that is of first importance in a dietary. Therefore, the very large percentage

of this constituent found in the legumes constitutes for us their special interest, and the true nature of the compounds in which this nitrogen exists is also of the utmost importance.

Most of the nitrogen found in the pea, bean, and lentil is in a form very useful as food. It was called by Liebig "plant casein," on account of its general resemblance to the casein of milk. Although its action as a food is similar to the nitrogenous matter of other vegetables, it is markedly different in some of its characteristics from, for instance, the gluten of grains. Pea and bean flour will not form a dough with water and can not be utilized for making porous bread.

DIGESTIBILITY OF THE BEAN, PEA, AND LENTIL.

Judged by the chemical analysis alone, we should give legumes the very highest place among foods, containing, as they do, more protein than the best cuts of meat, and in some cases a large percentage of fat, besides a considerable amount of starch. Pound for pound, they would thus be more valnable than meat or our best cereals. Forty years ago they were announced by Moleschott as "true treasure houses for the renewing of our blood," being equal in their albnmen content "peas to veal, beans to flesh of doves, while lentils left every kind of meat far behind."

Experiments on men and animals soon made it evident, however, that the true value of a food does not depend alone on the contained nutrients, but also on the ease and completeness with which the system utilizes these nutrients, since, to use the old adage, "man lives not by what he eats but by what he digests." Voit pointed out as early as 1869 that vegetable foods in general were less completely digested than animal foods, for three reasons:

(1) As generally prepared and used, the nutrients of vegetable foods are inclosed in cells, composed of cellulose or woody fibre, which is more or less hard and greatly interferes with their absorption.

(2) Vegetable food is prone to fermentation in the intestines, thus increasing the peristalic movements, and, if large amounts are eaten, hastening the food onward before there has been sufficient time for the absorption of its contained nutrients.

(3) The cellulose present acts as a local irritant and produces the same effect.

Practical Experience.—Practical experience, reaching to ancient times, testifies that beans, peas, and lentils are "hearty food." To quote the physician Galen, "they are harder to digest than other foods and give bad dreams." There is a general opinion that while they are suitable for robust people leading an active, outdoor life, indispensable to the soldier's outfit and to the logging camp, welcomed by the hunter and woodsman, and a necessary part of the food of the hard-working poor, they are, on the other hand, unsuitable for people leading a sedentary life, and are generally to be avoided by the invalid and convalescent. Such persons often complain of distress after eating beans, especially if the skins have not been removed, and of the disagreeable evolution of gas in the intestines, testifying as it does, to the fermentability of this class of vegetables. These foods are, therefore, called "indigestible," by which is meant in common speech that they give distress or that we are unpleasantly conscious of the digestive process. These symptoms, however, do not in general indicate anything as to the extent to which the contained nutrients of a food are absorbed or used in the system. When eaten in reasonable amount by persons in health, it is doubtful if they give rise to unpleasant symptoms. That no bad results attend their use is shown by the important place they have held in the diet since early times.

Laboratory Experiments.—Hoffman fed a man bread, lentils, and potatoes sufficient for his full nourishment and found that 47 per cent. of the contained protein left the system unused. Of meat containing the same amount of protein, only 17.7 per cent. was unabsorbed by the same person.

Woroschiloff, in comparing the digestibility of lentils with meat, found that from two to three times as much of the protein of the meat was utilized in the system as of the legume.

A very careful study was made by Strümpell of the extent of the digestibility of legumes. According to the results it would seem to depend largely on the form in which they are eaten. When he ate 250 grammes (about three-fifths of a pound) of beans cooked, as they ordinarily are, whole and with-

out removing the skins, 40 per cent. of the contained protein was unabsorbed, or four times as much as in the case of meat. On the other hand, when he used "Leguminosenmehl," a prepared food consisting chiefly of lentil flour, only 8.2 per cent. of the contained protein was unabsorbed. This equals the average digestibility of meat. As pointed out by other workers, this is, however, not a fair showing, since in order to eat enough of this lentil flour to even partially meet the conditions of the experiment, he was obliged to make it up into cakes with milk, eggs and butter, and the extent to which the nutrients of the legume were absorbed was, doubtless, much increased by the presence of stimulating animal foods.

Rubner, one of the later observers in this field, found a man who was able to eat for a few days enough cooked dried split peas (about 1⅛ pounds) to fully nourish him without help from other kinds of food, peas being selected because he liked them better than beans or lentils. Even with this large quantity only 17 per cent. of the contained protein was unabsorbed. It may be said that this robust individual does not represent the normal feeder, but the aim in this case is to show a comparison between this and other foods. The same man failed to use in the system 11 per cent. of the contained protein of macaroni.

Flatulence.—It is a matter of common experience that after the eating of legumes in any quantity there occurs what is known as flatulence or the formation of gas in the intestines. This effect is not confined to people of delicate digestion, although it is to them more distressing, nor does it seem to have anything to do with the extent to which the nutrients of the food are used in the system. Experiments with animals indicate that the formation of methan is entirely due to bacterial action on carbohydrates in the intestine. Rubner's man who digested so well the large amount of peas above cited complained very much of this disagreeable accompaniment. In India the mungo bean is highly esteemed and is eaten by the rich and by sick people, but always "with a seasoning of asafœtida to prevent flatulence."

Digestibility in Moderate Quantities.—The digestibility of legumes is thought to be largely a question of preparation and

amount eaten, as indicated above. Properly prepared and eaten in moderate quantities, peas, beans, and lentils cannot be called indigestible in the ordinary sense of the word. The entire removal of the skin by sieving is to be recommended in the case of persons with whom they seem to disagree.

As to the extent of the digestibility of the contained nutrients when eaten with the above restrictions they are probably as well used as those of other vegetable foods, but less so than the nutrients of meat. It should be remembered that a due amount of nonabsorbable or refuse matter is necessary in the food to insure the healthy action of the intestines, and it would be a great mistake to subsiitute, as a general thing, highly condensed foods for those containing some cellulose. None but the most hardy people could use the legumes as their sole source of nitrogenous food, since for that purpose 18 ounces daily of dried peas or beans would be necessary for a laboring man, an amount which could be furnished in not less than 6 pints of thick soup; but this fact has nothing to do with their use in moderate amounts, and there is almost no dietary in which they may not profitably find a place.

Digestibility of Peanuts.—The peanut is remarkable among the legumes for its large proportion of fat (50 per cent.) and its resemblance in taste and use to the true nuts. Long as the peanut has been cultivated in the South it has never to any extent taken the place of a food, but remains a food accessory for occasional use only. No laboratory experimeuts seem to have been made on human beings as to the extent to which peanuts are digested, but, according to general experience, the peanut eaten in any quantity is indigestible in the sense of bringing on pain and distress. This is probably on account of their rich, concentrated character. It is to be noted that when they are eaten in connection with other food, as bread, the ill effects are less marked.

VEGETABLE PROTEIN COMPARED WITH ANIMAL PROTEIN.

It has been well known that vegetable foods without any help from the animal kingdom will sustain men in health and working power, and careful experiments have shown that protein performs essentially the same part in nutrition, whether it

be from milk, meat, cereal, or legume. Among other experiments may be mentioned that of Rutger, a Dutch physician, and his wife, which lasted ten weeks. Their conclusion was that vegetable food can perfectly well be substituted for animal, provided only that it contain the same amount of nutrients in proper proportions. When living on a purely vegetable diet they relied largely on peas, beans and lentils, eating them in some form at nearly every meal. From an economic standpoint the average difference in the cost of the two kinds of diet was that less fuel was used to cook the animal foods eaten.

It is not improbable, however, that there are differences between animal and vegetable protein that cannot be tested by any method now at our command, differences which would explain the almost universal preference for some animal food in the diet. From our present knowledge it would seem that the mixed diet made up of both animal and vegetable food is the best and most practicable for the vast majority of people.

EXTENT TO WHICH LEGUMES ARE USED IN DIETARIES.

Since, as we have seen, peas, beans, and lentils contain as much protein as meat, and no other vegetable foods can approach them in this regard, we need not be surprised to learn that they are extensively used among all people who, either from necessity or from choice, eat little or no meat. This is but one of many instances of a wise choice of food made long before exact knowledge was able to give the reason for it.

Some food rich in protein will be found in the daily diet of all peoples. The Mongol eats with his rice, which is largely starch, small quantities of fish, fish eggs, and goose livers, but for his supply of proteid material he relies on his different preparations of bean cheese and on soja sauce, made from the soy bean. The Mexican, whose supply of meat is scanty and of a poor quality, uses the native bean or frijole at almost every meal, made into a stew with vegetables and perhaps shreds of sun-dried beef, well spiced with the chili or red pepper. The cooking is said to be done now in the unsightly American tin can (in this case a lard or kerosene can), which has almost supplanted of late years the primitive earthen pot described by travellers. The bean stew or porridge, with the tortilla or cake

of pounded corn, makes up the bulk of his food. The puchero or daily stew eaten by the poorer class of Spaniards has lentils for its basis, and with the Bedouins and other Asiatic people the porridge of lentils is in constant use. Church mentions twenty species of legumes, some having many varieties that are raised in India, and there they form, not an occasional, but a staple food among a people who, both by poverty and by religious scruples, are prevented from eating meat. There is a Hindoo proverb, "Rice is good, but lentils are my life." The Roman proverb, "The poor man grown rich no longer delights in lentils," intimates that though indispensable to the man of slender purse their too familiar flavor was gladly exchanged for the more expensive dish when it could be afforded. The legumes have been called the "meat of the poor." Nitti, an Italian writer, tells us that the Neapolitan bricklayers, restricted by their scanty wages to cheap food, but requiring food that is rich in protein, condemn themselves to a daily diet of kidney beans, a vegetable which is at the same time the cheapest and the richest in protein. With the Hindoo the lentil is reputed to have great staying power, and it is a favorite food among those who are to undertake long journeys. Parched as we parch corn, it is much esteemed in Egypt and Syria for this purpose. Arabs feed their horses ground beans to prepare them for extraordinary exertions.

In early days in the New England States the woodcutter who went out for a day's work in the woods in winter almost always took with him "bean porridge," *i. e.*, beans that had been cooked to the consistency of a thick mush and then frozen in bowls. In each bowl had been placed a string, which served to lift out the contents. By the help of the camp fire the frozen cooked beans were again made into porridge.

In the dietary studies made in connection with the nutrition investigations of the Office of Experiment Stations of the United States Department of Agriculture and the earlier work from which this inquiry developed, calculations were made showing the proportion of total nutrients furnished by a number of the principal classes of foods. Taking the average of some fourteen studies with professional men of varied income and living in different regions, dried legumes constitute 0.6 per

cent. of the total food and furnish 2.1 per cent. of the total protein of the diet—a small amount when their high food value is considered. Wheat flour furnished 8.4 per cent. of the total food and eggs 2.2 per cent., or 17.1 and 4.9 per cent., respectively, of the total protein. Considering the average results of fourteen dietary studies with mechanics' families and ten farmers' families, dried legumes furnished 1 per cent. of the total food material and 3 to 4 per cent. of the total protein, the proportions furnished by wheat, flour, and eggs being somewhat greater than in the case of the dietaries of professional men. The native inhabitants of the southwestern United States and Mexico are reported to consume large amounts of frijoles and other legumes. The average of four dietary studies of Mexican laborers living in New Mexico shows that these materials furnished 9.4 per cent. of the total food and 21.3 per cent. of the total protein. In this case eggs furnished only 0.8 per cent. of the total food and 1.6 per cent. of the total protein, while wheat flour furnished 12.3 per cent. and 21 per cent., respectively. In the case of professional men, mechanics, and farmers, the total amount of dry legumes used was small, and in view of the high food value, palatability, and low cost of this class of foods it might have been profitably increased.

PREPARATION OF LEGUMES FOR FOOD.

Since legumes are to be counted among our cheapest and most valuable food stuffs, if their contained nutrients can be digested, their choice and preparation is a matter of importance. The legumes are used—

(1) Chiefly for the tender pod, which for this purpose must be gathered when the seed is less than half grown. Such are the string bean and sugar pea.

(2) The nearly grown but unripe seed, as the "shell" bean and pea.

(3) The fully ripened seed, as the dried bean, pea, lentil, and peanut.

(4) The flour or meal made by grinding the fully ripe seed —bean, pea, or lentil, and peanut.

String Beans and Sugar Peas.—French beans (*haricots verts*), snap or string beans, are the immature fruit pods of sev-

eral varieties of the kidney bean, both the dwarf and the climbing. The best have little or no "string," some requiring no preparation for cooking. They must be freshly gathered and so young that the beans are hardly noticeable when they are cooked. After the string, if present, is removed, the pods are cooked, either whole or broken into bits. The German method is to cut them transversely a few times or "whittle" them. This seems to shorten the time of cooking and to allow of better distribution of seasoning. They are then boiled in salted water and drained, or the water may be thrown away after a few moments of boiling, the beans being then stewed in as little water as possible and the seasoning added when they are half done.

When the beans form the main dish of the meal, a piece of fat meat is often cooked and eaten with them. When the bean of most varieties is more than half grown the pod is no longer tender enough to be cooked in this way. String beans that must be cooked from one to two hours are not worthy the name. When young enough and freshly gathered they will cook tender in twenty to forty minutes. There are a few varieties of which the pod is tender until nearly ripe. Sugar peas are cooked in the same way as string beans. After the pods are full grown they become tough, but furnish a good quality of shelled peas.

Salted Beans.—String beans are sometimes salted for winter use. They can be kept thus for months, and during the time a bacterium is at work effecting a change somewhat similar to that brought about by the fermentation of sauerkraut. The vegetable fibre is softened and certain flavors developed by the process. Thus preserved they are a favorite winter vegetable among the Germans. Before cooking they are soaked over night to remove the salt. Shredded string beans are also dried or desiccated and are much used by armies and expeditions.

String beans and sugar peas or edible-podded peas, eaten as they are for the pod rather than the seed, fall in much the same class with spinach, cabbage, etc. They contain relatively little nourishment in proportion to their bulk and are valuable chiefly for their agreeable flavor, the salts contained in them, and the healthful variety given to the diet.

Shell beans and Green Peas.—Immature or green peas and

beans freed from the pod are a highly valued article of diet in almost all countries. They contain a good proportion of proteid material and starch. The cellulose, so woody in the ripened seed, is still tender and easily cooked and the flavor is excellent. The method of preparation is very simple. They must be freshly gathered and shelled, as they deteriorate rapidly in flavor and each hour that passes after their removal from the vines increases the length of time necessary for their cooking. They should be stewed rather than boiled, the water being reduced to only enough to moisten them, and the seasoning, including a generous quantity of butter, added while the beans or peas are only half cooked. A sprig of mint added to green peas when cooking is liked by some; but it may be said in general that so delicate a flavor as that of green peas should not be covered by any strong or pungent additions. The French have a special dish, *haricots verts panaches*, or "variegated" green beans, which is a mixture of the young shelled bean with string beans.

Canned Beans and Peas.—Beans and peas are canned in large quantities. It would seem that the process might be improved, since much of the tastelessness of canned peas is said to be due to the fact that the water in which the peas are boiled is thrown away in the process of "blanching." Canned beans and peas are simply preserved, cooked foods having, in general, the same composition as those that come freshly cooked to the table.

Dried Peas, Beans, and Lentils.—Green peas and beans are often to be classed among delicacies, but we have in the ripened seed a standard food for all classes. Like the grains, they have good keeping qualities and can be combined with other materials into a variety of palatable dishes. Only fat is needed to make of beans and peas a complete food in the sense that the combination furnishes the proportion of protein, fat, and carbohydrates required by the accepted dietary standards. Hence the popular combination of beans and peas with fat meat, as pork and beans, bacon and peas, corned beef and beans.

Quality.—A well-dried bean is smooth and shining; one poorly dried may be of inferior quality with folds in the skin. The best beans are of uniform size, not too small nor a mixture of different kinds. The larger are in general preferred because

they have a smaller proportion of skin, but there are several varieties of small beans that bring a high price because they have a thin skin and fine flavor. Heavy, well-filled beans bring a higher price, the weight of a bushel of different kinds varying by several pounds. The value of the dried legume depends finally on whether it will cook soft, and this is to be determined for a given lot only by putting a sample to the test. The main requirements in the cooking of dried legumes are:

(1) To so soften and disintegrate the cellulose that the nutrients that exist in close connection with it are freed.

(2) To cook the proteid constituent so as to make it digestible and palatable.

(3) To swell and burst the starch grains.

(4) To combine with various flavoring matters, as salt, pepper, fat, herbs, and butter or fat meat so that the result shall be a palatable dish.

Treatment of the Skin.—The first step in the ordinary household practice is the swelling and softening of the legume by soaking in water a number of hours, usually not less than eight, and the removal of such parts as will not soften by cooking. Some cooks, however, believe it is not necessary to soak the beans. They cover them with hot water and allow them to stand a short time before boiling. The first method is to be preferred.

In the ripened and dried legume, the envelope becomes tough and leathery; even when cooking has done its utmost, these skins and hulls pass through the intestinal tract quite unchanged. The skin of the ripened pea and lentil is easly removed and the "split pea" and the lentil, as generally sold, have this decided advantage over the bean in the making of digestible soup and porridge. Many kinds of beans, however, after proper soaking, may be freed from their skins by stirring in water. The skins rising to the top are then skimmed off. The large Lima beans after soaking may be easily slipped out of the skin by pressing between the fingers. They can then be boiled and served as a vegetable of the consistency of mashed potato—sometimes called bean pudding. Peas pudding cooked in the same way is a familiar dish. In cooking beans for soup the skins may be separated by sieving.

Hard vs. Soft Water for Boiling.—The water for cooking dried legumes, it is agreed by all writers on the subject, should not be "hard" water, by which we mean that which is impregnated with various salts, as lime and magnesia salts, since the legumin of the seeds forms with these salts insoluble compounds with the result that portions of the vegetable remain hard, no matter how long they are cooked. Rain water is preferable for cooking legumes.

Strümpell in the course of his experiments on the digestibility of legumes compared the use of distilled water with that to which a certain amount of lime salts had been added. Lentils cooked in distilled water took up nearly double their own weight of water and cooked soft in one and one-half hours. Some of the same kind of lentils cooked in the hard water took up only their own weight of water and after boiling for the same length of time only the skins had swollen and lay in folds over the kernel, which remained entirely hard. Such extreme results would not follow the use of ordinary hydrant water, as it is less hard than the artificially hardened water in this case, but in proportion as it contains these salts it is unsuitable for the cooking of legumes.

The question then arises, What is to be done when the only water obtainable for cooking is hard water? In most books on cookery it is advised to add to the water in which peas and beans are cooked a small quantity of baking soda, a teaspoonful to the gallon, since, if the hardness is due to calcium carbonate, the soda will remedy it. Peas and beans cooked in this water are indeed easily softened, but experiment shows that the flavor is apt to be injured. If soda is added to the water it is better to boil and cool it and pour away from the sediment before using. But since the cook has generally no means of knowing the degree of hardness of the water and thus the exact proportion of soda to be added, it is probably better to simply boil the water before using and pour it from the sediment, since boiling alone will precipitate the bulk of the lime or calcium carbonate. When the hardness is due to the presence of the sulphate of lime or magnesia, neither boiling nor the addition of soda will avail. It is often possible to use rain water for cooking legumes, and this naturally distilled water is the very best for

the purpose. The soft water should be used both for soaking and cooking.

Flavor.—Soaking legumes in fresh water seems also to remove a certain bitter taste, especially noticeable in lentils, and in Eastern countries lentils are sometimes soaked for days for this purpose.

All dry legumes require a long application of heat, not only to soften the cellulose, but to develop the proper flavor; some say as long as twelve hours. The difference of opinion on this seems due to a differing estimate as to what is the desired result. The dried pea or bean that has been soaked overnight in water may be in one and one-half to two hours cooked soft enough to be pressed through a sieve, but the tongue can still detect individual grains. To disintegrate and soften absolutely every particle and to develop the best flavor a much longer time is needed. The dish of pork and beans baked all night in the New England brick oven, the pea soup slowly cooked for twelve hours, as in some of the special ovens which cook food very slowly, are instances of legumes properly prepared. The flavor of dry legumes is thought by many to be improved by the addition of onions and flavoring herbs or meat broth. Perhaps the best, as well as the most common, method of preparing the dried pea and lentil is in a thick soup or purée seasoned with salt, pepper, and butter. Beans are also often cooked in this way, although perhaps more frequently served in the United States as baked beans.

Baked Beans, Peas, and Cowpeas.—After a preliminary boiling beans, peas, and cowpeas may be baked in an oven, with various additions thought to improve the flavor, as pork, molasses, etc. The small white or navy bean is quite generally used for this purpose, chiefly because its skin is thin and tender, but the mode is well adapted to all varieties of beans. It is generally thought that the fat present in such dishes improves their flavor.

Roasting.—While roasting is almost the only method in use among us in the preparation of the peanut, it is perhaps never applied in the United States to the other legumes. The pea and the lentil are roasted in the Mediterranean countries, and form there a regular article of food. In India peas are parched in

hot sand. For a people who possess only primitive cooking appliances, roasting certainly has the advantage over boiling. Just as a quantity of peanuts may be roasted with a handful of charcoal, while at least two hours of stewing are needed to soften them, so the chick-pea, as found by experiment, can be parched over coals in a few moments and thus made edible. The taste reminds one of pop-corn and roasted chestnuts. A slight bitterness is present, due, probably, to the skin, which does not slip off in roasting, as does the skin of peanuts. When this skin is removed before roasting, as it may be by a half hour's soaking, the product is improved.

Although these roasted legumes may not be needed as an addition to our bill of fare, it is easy to see how valuable they may be to the Arab who toils over arid plains or to the native of India in his mountain journeys.

Our common split pea is also palatable when parched. Parched peas are too hard for any but the strongest teeth, and, as used in India, they are ground and cooked after parching. The roasted chick-pea is also used as a substitute for coffee. The roasted peanut is spoken of later.

Pea and Bean Flour.—Since it has been shown by such investigations as those of Strümpell that the legumes when ground into flour and cooked in soup or baked in cakes are much more completely digested than when cooked whole, it would seem that bean, pea, and lentil flour, as such, would be common in the market. It is, however, offered only in small packages mixed with the flour of grains and sold under various trade names as a nutritious and digestible food, especially recommended for invalids. In preparations for the market it has been cooked for a long time under pressure.

In certain countries of Europe a proportion of bean flour is mixed with wheat flour for bread making, especially with wheat which has a low percentage of gluten or that in which the gluten has deteriorated in quality because of the sprouting of the grain in wet seasons. In such cases an addition of 2 to 4 per cent. is thought to improve the bread, and 2 per cent. if stamped on the package, is allowed by law.

Soup Tablets and Pea Sausage.—Finely ground peas, beans, and lentils form the basis of many soup tablets and condensed

fosod used extensively by armies, explorers, etc. The best known is the "pea sausage," which did such good service for the German troops in the Franco-Prussian War. It was invented by a cook, and the German government bought the secret of its preparation. It consists of pea and lentil flour well cooked, evaporated, and mixed with a proportion of bacon, the proper seasonings, and some preservative. Mixed with hot water, it made a very nutritious soup for the soldier. It was found by the German army to be invaluable, if used only in emergencies, but its continuous use brought on digestive disturbances and the eater soon tired of its taste.

Peanuts and Peanut Preparations.—Of the 4,000,000 bushels of nuts raised in this country 3,000,000 bushels are used as roasted peanuts. The remainder of the crop and the peanuts of an inferior grade go to the confectioner and appear in peanut candy and other confections. Therefore at present the peanut, as used among us, is hardly to be considered a food, but, as already said, only as a food accessory or luxury. It is quite possible, however, that this highly nutritious and cheap product of our Southern fields may come to be used in more ways than it is at present, and especially in combination with other food materials.

The roasted nut, ground into an oily meal and generally mixed with water to the consistency of butter, has been put on the market and is used to spread on bread. There are those who like its flavor when it is fresh. There seems to be but little known as to its digestibility in this form.

Peanut Oil.—At present the American peanut crop is not large enough to more than supply the roaster and the confectioner, hence the expressing of oil from the peanut has never become established here, but in Europe large quantities of the African-raised nut are used for this purpose. The shelled nuts contain from 30 to 50 per cent. of oil. The oil is said to be of fairly good flavor, but inferior to olive oil. In 1899 some 80,000 tons of the nuts were used in Marseilles alone for oil making. The unhusked nuts are passed between a pair of rapidly revolving grooved rollers and the shells and red inner skins are then removed by a winnowing process with the use of air currents and oscillating sieves. The cleaned kernels are ground

and then enveloped in fibrous mats and pressed to extract the oil.

According to Brannt, "the first cold pressure yields 16 to 18 per cent. of very fine table oil. The residue is then broken up, moistened with water, and again cold pressed, yielding 7 to 8 per cent. of more or less valuable oil, used for table purposes and burning. The residue from this is heated and then pressed, giving 7 to 8 per cent. more oil, unfit for table use, but used for soap and lubricating." The finer grades of oil are sold as salad oil alone or mixed with olive oil.

Peanut Cake.—When the oil has been pressed from the ground peanut, the mass remaining, called oil cake, is used for fattening cattle. Some experiments have also been made as to its food value for human beings. Containing, as it does, 47 per cent. of protein and 9 per cent. of fat and starch, and costing about 5 cents a pound, this food attracted the attention of German scientists. The oil cake was broken up and cooked a long time in water and eaten as a soup or porridge in a hospital. Most of those who tried it ate it with apparent relish, not only once, but again and again. No effort seems to have been made to ascertain to what extent it was digested, and the use of the cake does not seem to have passed the experimental stage.

COMPARATIVE VALUE OF LEGUMES IN RELATION TO THEIR COST.

The legumes have been spoken of as economical foods. In the table below is shown the nutrients and energy furnished by 10 cents' worth of the different fresh, dried, and canned legumes commonly eaten in the United States. For purposes of comparison similar values are included for some of the common animal and vegetable foods. In all cases the values are calculated on the basis of the composition of the food materials as purchased, and include the usual amounts of inedible material (pods, bones, etc.) The prices selected per pound are necessarily somewhat arbitrary. They are, however, based on actual market conditions found in dietary studies and other investigations, and are believed to represent a fair range of prices. The legumes, although staple foods, have not yet attained the importance of the cereal grains, and therefore vary more in price.

NUTRIENTS FURNISHED FOR 10 CENTS IN LEGUMES AND OTHER FOOD MATERIALS AT CERTAIN PRICES PER POUND.

Food materials as purchased.	Prices per pound.	Ten cents will pay for—				
		Total food material.	Protein.	Fat.	Carbohydrates.	Fuel value.
	Cents.	*Pounds.*	*Pound.*	*Pound.*	*Pounds.*	*Calories.*
Kidney beans, dried	5	2.00	0.45	0.04	1.19	3210
Frijoles, dried	4	2.50	.55	.03	1.63	4190
Lima beans, fresh, in pod	3	3.33	.11	.01	.33	850
Do	4	2 50	.08	.01	.25	640
Lima beans, fresh, shelled	6	1.67	.05	01	.17	425
Do	8	1.25	.04		.12	320
Lima beans, canned	6	1.67	.07	.01	.24	600
Lima beans, dried	4	2.50	.45	.04	1.65	4665
Do	6	1.67	.30	.03	1.10	2715
String beans, fresh, 20 cts. per pk	2	5.00	.11	.02	.35	900
String beans, fresh, 30 cts. per pk	3	3.33	.07	.01	.23	600
Beans, baked, canned	3	3.33	.23	.08	.65	2000
Do	5	2.00	.14	.05	.39	1200
Lentils, dried	10	1 00	.26	.01	.59	1620
Do	6	1.67	43	.02	.99	2705
Peas, green, in pod, 20 cts. per pk	2	5 00	.18	.01	49	1275
Peas, green, in pod, 30 cts. per pk	3	3 33	.12	.01	.33	850
Peas, canned	5	2.00	.07		.20	510
Do	7	1.43	.05		.14	365
Peas, dried	3	3.33	.82	.03	2.06	5510
Do	4	2 50	.62	.03	1.55	4140
Do	5	2 00	.49	.02	1.24	3310
Cowpeas, green, shelled	5	2.00	.19	01	.45	1240
Cowpeas, dried	2	5.00	1.07	.07	3.04	7950
Wheat flour	2	5.00	.57	.05	3.76	8250
Do	2.5	4 00	.46	.04	3.00	6600
Do	3	3.33	.38	.03	2.50	5495
Wheat bread	3	3.33	.31	.04	1.77	4045
Do	5	2 00	.18	.03	1.06	2430
Do	8	1.25	.12	.02	66	1520
Corn meal	2	5.00	.46	.10	3.77	8275
Do	3	3.33	.31	.06	2.51	5510
Oatmeal	3	3.33	.54	.24	2.25	6195
Do	5	2.00	.32	.14	1 35	3720
Rice	6	1.67	.13	.01	1.32	2720
Do	8	1 25	.10		.99	2040
Potatoes, 45 cents per bushel	0.75	13.33	.24	.01	1.96	4130
Potatoes, 60 cents per bushel	1	10.00	.18	.01	1.47	3100
Potatoes, 90 cents per bushel	1.5	6.67	.12	01	.98	2070
Cabbage	4	2.50	.04	.01	.12	315
Do	5	2.00	.03		.10	250
Beef, sirloin	10	1.00	.16	.18		1040
Do	15	.66	.11	.12		685
Do	20	.50	.08	.09		520
Do	25	.40	.06	.07		415
Beef, round	8	1.25	.24	.16		1120
Do	12	.83	.16	.11		745
Do	16	.63	.12	.08		565
Ham, smoked	10	1.00	.14	.33		1675
Do	16	.63	.09	.21		1055
Do	22	.46	07	.15		770
Salt pork	12	.83	.02	.72		3045
Codfish, fresh	6	1.67	.14			275
Do	10	1 00	.08			165
Codfish, dried, salt	6	1 67	.27	.01		525
Do	8	1 25	.20	.01		395
Eggs, 15 cents per dozen	8.8	1.14	.15	.11		725
Eggs, 25 cents per dozen	14 7	.68	.09	.06		430
Eggs, 35 cents per dozen	20.6	.49	.06	.05		310
Milk, 3 cents per quart	1.5	6.67	.22	.27	.33	2170
Milk, 6 cents per quart	3	3.33	.11	.13	.17	1080
Milk, 8 cents per quart	4	2.50	.08	.10	.13	815
Cheese, whole milk	12	.83	.22	.28	.02	1620
Do	16	.63	.16	.21	.02	1230

It will be seen that at the prices selected the dried legumes furnish more protein and energy than almost any food material

except cereal grains, while the fresh legumes are directly comparable with our most nutritious green vegetables. Dried cowpeas at the price noted above furnish more protein and energy per pound than any other legumes and almost twice as much protein and nearly the same amount of energy as wheat flour at 2 cents per pound. Dried kidney beans at 5 cents per pound supply about the same protein and half as much energy as wheat flour at 2½ cents per pound. The facts brought out in the above table show the importance of legumes when considered from the standpoint of pecuniary economy and go to prove that they may profitably be used to a considerable extent as a source of protein when the diet is deficient in this constituent and the income is limited.

SUMMARY.

The green or immature pea and bean are among our most valuable green vegetables and fully deserve the place they now hold on our bill of fare. The value of the dried pea, bean, and lentil is such that one or more representatives are found in every country as a staple food, and they have been thus used from the earliest times. They are especially rich in protein, the nitrogeneous constituent which forms the chief nutrient of meat, and are thus fitted to take the place of part of the meat in any dietary. Since in comparison with their value their price is low, they must be considered among vegetable foods as next in importance to bread. As compared with the cereals the legumes are (1) less completely digested if eaten in considerable quantities; (2) it is improbable that they can be made into any form of palatable bread, and (3) their flavor is less generally liked, and on that account will not be made a regular daily food except by people who are forced to it by necessity. In view of their low cost and high nutritive value, however, they may profitably be used even to a greater extent than they are at present.

Care in the preparation of legumes is very important both as regards their digestibility and their flavor.

RUSSIA'S PROGRESS IN EAST ASIA.

By CARL SCHULTZ, Naval Senior Lieutenant, June, 1900.

Translated from the *Marine Rundschau* of August-September, 1900.

(*From the Journal of the Royal United Service Institution.*)

THE countries of Asia bordering on the Pacific Ocean, the territories drained by the rivers flowing into it, and also the bays indenting the coasts, together with the groups of islands, are comprised under the heading "East Asia."

Of this enormous area Russian East Siberia and the three neighboring States, viz., China, Japan and Corea, are taken into account in considering, politically, the advance of Russia in Eastern Asia. Moreover, regard has also to be paid to England —Russia's greatest European rival—with her regular line of stopping-places towards the east and her three bases: Singapore, Hong-Kong, and Wei-Hai-Wei.

I. THE HISTORY OF THE ACQUISITION OF EASTERN SIBERIA UP TO 1861.

The conquest of Eastern Siberia was commenced by Russia in the expeditions of the Cossack leaders—Pojakov, Chabarov, Stepanov, Paschkov, and Tschernigovski—who, with their followers, invaded and plundered, from the year 1643 onwards, the Amur region from Yakutsk and Yeniseisk, and in their excursions even penetrated far into Manchuria. The leaders of these marauding expeditions compelled the individual tribes to pay tribute, and constructed fortified positions as starting places for their further enterprises. The especial object was to acquire Albasin, which has been the chief town of the Russians since 1651. In 1659 and 1685 the Chinese conquered Albasin and destroyed it. In 1665 Tschernigovski occupied the Amur region and placed his conquests under the dominion of the Tsar, who declared them a Russian province. Russia had, however, even in 1869, after Albasin had withstood a siege for a year, to enter into negotiations with China, which led to the treaty of Nertschinsk, by which the whole of the conquests on the Amur again reverted to China.

This unique and extraordinary energy of China, which despatched troops over a period of ten years into such distant districts for reconquest and conquest, had its origin in the Tsing dynasty, which commenced to reign in 1644, and whose mother country was in Manchuria. The first emperors of the Manchu house had naturally a particular regard for the interests and boundaries of their former home.

In the following half of the century the Amur remained lost to Russia. But it was during this period that the other portions of Eastern Siberia, viz., Kamschatka, the Kurile Islands, the Aleutian Isles, and also Alaska (Russian from 1822 to 1867, and in that year ceded to the United States) were occupied.

The attention, however, of the Russian government, owing to the toilsome and difficult communications by land and sea with these lands, and likewise to the want of harbors on their shores, was always directed to the Amur—the waterway of which, although then unexplored, promised many advantages; for this was the only river of Siberia which did not flow into a sea continuously covered with ice, and which could alone, consequently, furnish an exit to the open sea. Peter the Great and Catherine the Second had already hinted at the conquest of the Amur as a necessary step for the development of Russia in the East, without, however, being able to bring the question any nearer to a head, for the immense interests of the empire continuously interfered to prevent this scheme of advance. A change in the opinion of the value of the Amur did not occur until the end of the fortieth year of the last century. In 1846 the Tsar Nicholas the First sent an expedition under Lieutenant Govrilov to the mouth of the Amur in order to ascertain whether the assertion made by La Pérouse, Broughton, and Kousenstern that the mouth of the Amur was not navigable for ships and vessels was correct. This expedition reported that the depth of the mouth was one and one-half to two feet, and, therefore, that the chief value of the river as furnishing Siberia with an entrance to the open sea did not exist. In consequence of this the Amur question was dropped, so far as Russia was concerned. Steps were then taken to enlarge Petropavlovski, on the eastern coast of Kamschatka, in order to make it

the chief port and military station of Russia on the Pacific. It was fortunate for Russia that Muraviev was appointed General Governor of Eastern Siberia in 1847, as he clearly recognized the interests of the country, and forthwith reopened the Amur question. In St. Petersburg his plans were not altogether favorably looked upon, as the unfavorable result of the expedition of 1846, and likewise the fact that the advent of Russia in the Amur region might lead to a breach with China, had had a deterring effect. This apprehension, which had existed since the unfortunate experiences resulting in the treaty of Nertschinsk, and which had its foundation in the remarkable overestimate of the power of the Chinese Empire, misled the Russian diplomats for the space of a century to constantly adopt a policy of defense towards China, which was interpreted by that power as weakness, inciting it to violent acts against Russia and disturbing on many occasions the relations between the two countries. Muraviev completely broke away from this timorous policy. His political maxim was, "Oppose China, not with words, but actions"—a maxim to which he was indebted for his great political success, and which has been found to answer to the present day, not only by Russia, but also by all other powers. In his preliminary steps, Muraviev had himself to be responsible. In 1849 he sent the transport *Baikal* to the mouth of the Amur. This ship was commanded by Captain-Lieutenant Nevelski, a man filled with enthusiasm for Muraviev's far-seeing plans. After this ship had surveyed and established the fact that, at its mouth, the Amur was accessible for ships and vessels approaching from either the north or south, and that Saghalien was an island—the idea formerly being that this island was a peninsula, the northern part of which was connected with the left bank of the Amur—Nevelski, being impressed by the immense importance of the highway of the Amur to Russia, and in spite of the explicit edict of the Tsar that no settlement was to be made, ceremoniously hoisted the Russian flag on the 1st (13th) August, 1850, on the promontory of Knegda, on the left bank of the Amur, and here founded Nikolaievsk. After long deliberation he succeeded, through the intercession of Muraviev, in obtaining the Tsar's sanction in 1851 to this act.

This was the decisive turning-point in the policy of Russia in the Far East.

Nevelski was entrusted with the continuance of the explorations and was placed at the head of the Amur expedition, which consisted of 60 seamen and Cossacks, with two officers and a surgeon. A whale-boat and a yawl were also placed at its disposal.

Although the strength and equipment of the expedition were deficient, large secret powers appear to have been given to the leader. After the foundation of Nikolaievsk, which was used by Muraviev as a feeler against China, a certain liking for this policy of Muraviev and Nevelski was aroused in St. Petersburg, for which, however, the Russian Foreign Office would not undertake any responsibility, but the results of which would be accepted under the definition that "where the Russian flag has once flown, it must not be pulled down."

In the occupation of Nikolaievsk the friendly relations with China were not disturbed. It is true that in Pekin consent was not given, but, on the other hand, nothing was done by way of protest.

In consequence of this, Nevelski took a further step towards the south, after the climatic and hydrographical conditions of the Gulf of Tartary had been inquired into, and it had become recognized that these were considerably more favorable than on the Amur-Liman. Although not officially empowered by his government, he established in 1853, for the military occupation of the respective districts, the Marien post on the Amur, the Alexander post at Castries Bay, the Constantine post in Emperor's Harbor, the Iljen post on Saghalien Island, and the Muraviev post in Southern Saghalien. The Tsar gave his assent to the proceedings, and Nevelski received the rank of governor; a naval company of 240 seamen, a sotnia of mounted Cossacks, and a train of mountain artillery being placed at his disposal.

China again did not give her assent, but neither did she attempt to oppose Muraviev's enterprises.

It was shown, even in 1854, how important the actual acquisition of the Amur was. Owing to England's absolute command of the sea during the Crimean War, Russia was compelled

to use the land route for equipping, strengthening, and provisioning its Eastern ports. The only way, therefore, to do this was via the Amur. The Chinese government had not then given its permission to Russia to navigate this river, which was controlled by the Chinese fortress of Aigun, on its right bank.

Muraviev was, however, directed by his government to commence, even without permission, transport on the river.

The expedition consisted of a combined line battalion of 800 men, a mounted sotnia of Transbaikal Cossacks, a half mountain battery, and large quantities of food and military stores. With 75 rafts and small craft and the small steamer *Argun* the journey was commenced in 1854 from Nertchinsk.

The Chinese governor of Aigun refused to grant permission to use the river, but withdrew his refusal after a short and energetic discussion with Muraviev, who pressed forward close to the fortress with the intention of fighting.

This reinforcement brought the Russian fighting strength in the East up to the following numbers:

1. Petropavlovski - - 1000 men, the frigate *Aurora* and corvette *Alwaza*.
2. Nikolaievsk - - 430 men, with 2 guns.
3. Emperor's Harbor - 106 men, 8 guns, and the frigate *Pallas*.
4. Alexander Station - 104 men, with 1 gun.
5. Marien Post - - A sotnia of Transbaikal Cossacks, a half mountain battery, and 8 men.

The posts on the island of Saghalien had been vacated. Shortly after the arrival of the reinforcement at Petropavlovski, a combined English and French squadron attacked, but was beaten back with considerable loss. The Russian casualties amounted to 37 killed and 75 wounded. Muraviev then decided, on account of its isolated position and its bad land communications, to vacate Petropavlovski, which was successfully accomplished in 1855 with the assistance of the two ships stationed there and three transports.

A second large transport in that year, and a third in 1856, which went down the river with 3000 and 1600 men respectively, reinforced and provisioned in the succeeding years of

the war the garrisons of the East. The last transport established posts at the mouths of the Kumara, Sija, and Sungari, and, likewise, at the junction of the Amur with the small Chingan.

Once again the Chinese government did not give their consent, but neither did it venture to attempt opposition.

On account of the difficulties in respect of commissariat, a portion of the troops was sent back to Yakutsk after the conclusion of peace. To replace them endeavors were made to establish colonies of Transbaikal Cossacks along the whole course of the Amur in order to render the territory permanently secure. Two river steamers effected regular postal communication between them and the stations.

The "Maritime Province" was formed for the purposes of better administration. This comprised Kamschatka, the shores of the Ochotsk Lake, the Udsker region, and all the Russian possessions on the lower Amur and the Gulf of Tartary, and was placed under the general government of Eastern Siberia.

In the spring of 1858, after the negotiations of 1855 at the request of China respecting the frontier had proved abortive, and Russia had strengthened its forces on the Manchurian and Mongolian boundary to 22,000 men and 40 guns—China, moreover, being engaged in fighting England and France—Muraviev regarded the moment as favorable to commence fresh negotiations respecting the settlement of the Amur question. By the treaty of Aigun the whole of the left bank of the Amur east of Usuri was ceded to Russia. On the Amur, Sungari and Usuri were to be free places of commerce for Russian and Chinese ships. As in this treaty of Aigun the delimitation of the country east of Usuri was not settled, and as every year Nicholaievsk and the mouth of the Amur were blocked with ice for some months, Muraviev proceeded further south. On the 20th July (1st August), 1860, he caused Port May (the later Vladivostok), on the southern end of the peninsula called after him, and Possiet Bay, quite close to it on the Korean frontier, to be occupied. In the same year, a treaty was concluded in Pekin by Count Ignatiev, in which the Chinese government recognized Russian ownership over the Amur and Usuri regions, and by which the frontiers were settled which stand, of-

ficially, to the present day, with the exception of Port Arthur and Talienwan.

Russia thus acquired without the use of the sword this rich and large (five times as large as Germany) territory, so important for the development of Siberia, and that by the safe and energetic policy of only two men. Muraviev resigned his post as Governor of Eastern Siberia in 1861. The Tsar conferred upon him the title of count, with the honored surname of Amurski, in recognition of his great services. The military-political portion of the occupation of Eastern Siberia, had at his retirement, been provisionally settled.

II.—THE ADVANCE OF RUSSIA SINCE 1861 IN EASTERN ASIA, FROM AN ECONOMIC POINT OF VIEW.

A.—Colonization.—The necessity arose, on acquiring the new country, of making investigations with the view of peopling the land with Russian settlers who could turn to good account the rich natural products of the soil and exploit its hitherto untouched treasures below—transferring there as true Russians their Russian habits and feelings, and creating a new home for themselves and their children. Thus the land which was only nominally under the Russian government would effectually become Russian.

Since the serfs had been given their freedom, Russia had, owing to their large natural increase, an excellent race in its agricultural population for the colonization of this enormous cultivable land.

The division and leasing of the land to the colonists was simplified in that the whole of Siberia was the property of the state (or crown land)—no matter whether it was desert or peopled by Russian peasants or other settlers. Only the southern half of the government of Tomsk—the Altai mining district—was the possession of H. M. the Tsar. In addition a few small portions of land belonged to private individuals, monasteries, and communities, etc., to whom they had been granted or sold in the fifties. They were, however, very small in extent as compared with the crown lands.

The Amur maritime province, which, properly speaking, comprised East Asiatic Siberia, belonged up to 1887 to the general government of Eastern Siberia. In this year the Amur

general government was formed and sub-divided for administrative purposes into three districts, viz.: The Transbaikal, Amur, and the maritime provinces. It comprised the whole of the Russian portion of the Amur basin and the country bordering on the Japan, Ochotsk and Behring Seas, excluding the island of Saghalien and Kamschatka, which possessed their own particular administration.

The Amur government was, as regards colonization, more suitable than the rest of Siberia, as it possessed so much cultivable land that each peasant could possess as much as he wanted, having regard to his means.

Of its three sub-divisions, the Transbaikal is, on account of its large cultivable areas of land—about one-third of 4000 square miles—the most suitable for settlers; the conditions are similar in the Amur basin, the gold mines of which are only waiting proper working.

The Usuri basin, with its rich forests and coal-fields, promises a great future with China owing to the latter's scarcity of forests, especially when the means of communication are improved.

Saghalien has the least hopeful outlook, due to its inhospitable climate, but even this country has a certain value in view of its coal mines and naphtha wells. The unfavorable climate and conditions of the land of Kamschatka and Ochotsk regions render them practically worthless.

In consequence of their very favorable circumstances, and of the exceptional political value of these lands, Russia has endeavored to guide the mighty stream of its emigrants towards Transbaikalia and the Amur and Usuri basins.

In 1861 the government guaranteed these emigrants the following concessions, which still obtain:—Crown land is allotted to each family or community—about 109 hectares to each family. The settlers have no payment to make for its use for 20 years, and are freed from all imposts and liability for service to the government. If the land at the end of this period has not been purchased (3 roubles per hectare) an impost, fixed by the government, is paid for its further use. In case a colonist requires more land than falls to the lot of his family he has to pay three roubles for every additional hectare of which he be-

comes possessor. Each man is freed from service for ten years and from the payment of taxes to the local administration. A further great advantage was given in 1886, viz., a free passage to Vladivostok from Odessa on the ships of the Volunteer Fleet. In the event of a settler wishing to transfer to another place at his own expense, he has to prove that he will still have a sum of 400 roubles, after abating the cost of removal, in order to be able to fit out his new settlement. If it be desired to enlarge this settlement he may receive an advance of 600 roubles, which need not be repaid until after 33 years.

Moreover, a fund has recently been established for the whole of Siberia for furnishing assistance when required. Advances are made out of this fund, not only for the journey, but to meet the expense of building houses and for their equipment. Further, means are also placed at the settler's own disposal. Storehouses are furnished with agricultural implements, wood material, and seeds of various kinds, etc., in order to supply, at the starting of the farms or settlements, the necessary requirements *in natura*. Steamers are chartered for the conveyance of settlers on the rivers, and experienced people engaged to conduct these transports and to assist the colonists on their journey, as well as also to their settlements. Particular privileges are given to settlers discharged from military service or in the Reserve. Also men who have completed their military service with the Siberian troops may settle there with their families with similar rights as the other settlers have. Thus the colonization of these lands remains in the hands of the government, who conducts it in accordance with political views and in the interests of the whole country. The whole direction of the colonization of Siberia by people from European Russia was placed in 1896 under the control of the Minister of the Interior, by whom was instituted a special "Colonization Department." Only emigrants who comply with the regulations of this department participate in the privileges which are granted by the government.

It appears from these regulations that the Russian government is fully aware of the value of Russian colonization, and does everything in its power to induce the colonist to settle in these districts. This is recognized as a vital necessity for the power of Russia and for the prosperity of these lands.

If the bad communications, especially when the colonizing commenced, are considered, it can well be said that Russia may be satisfied with the present result. At the census of 1897 there were about 450,000 Russians in Transbaikalia—approximately 70 per cent. of the total population. In the Amur region (which is the same size, about 11,000 square miles) the number of Russians amounted to about 110,000, who composed about 80 per cent. of the total population. The Asuri maritime province and Saghalien—about 7000 square miles—had about 130,000 Russian settlers, or about 75 per cent. of the population. The Ochotsk and Kamschatka district, with its unfavorable conditions, numbering only 35,000 inhabitants (about one to a square mile), had approximately 7000 Russians, therefore 20 per cent. Thus it is evident that with the opening of the Siberian Railway the number of settlers will, in these distant parts, constantly grow, and that the Colonization Department will, owing to the importance of these districts, direct them there. Moreover, when the railway is completed, agriculture—the most important source of industry of the Siberian people—will become more profitable, owing to the facilitated means of export and conveyance to market, and thus this country will become more suitable for settling in.

A further way of colonizing is the method of compulsorily sending people to Siberia annually. At the present day the number that are yearly sent amounts to over 12,000 persons of both sexes. The distribution of these among the governments is very unequal. In the Amur government their number is very small. Only the island of Saghalien is exempt, this being entirely a convict colony. There are here about 4000 men and 1000 women convicts—most of them murderers, robbers, political offenders, and important criminals, who for the most part have come from the Siberian prisons. About one-half of the convicts live in prison; the rest in semi-freedom in the convict colonies, the Dui coal mines, the Dui farms, in Kosakovsk, and in Aniwa Bay. The central station of the whole prison arrangements in Saghalien is the locality of Dui. Here there are four large prisons.

This means of colonizing, on the whole, is not conducive to the best interests of Siberia. The men are very inferior and

their health imperfect. Many of them are subject from the time of their release with infectious and, in particular, venereal diseases. Their descendants compose a grievous public nuisance. A portion of the settlers that are compulsorily sent (*posselenzy*) wander about the country as beggars; the remainder possess houses. These latter, however, will contribute little to the well-being of the settlement, as only seldom does a peasant or farmer give his consent to his daughter marrying a *posselenzy*. They are mostly therefore, unmarried men or women, who are little liable to found a family. The prostitution which is rife amongst them, and the sickness arising therefrom, prevents, moreover, an increase in this people. The comparison of the numbers of men who are accompanied by their wives is as 1 is to 6; much less is the comparison of women accompanied by their husbands.

It moreover appears that the people of Siberia suffer very pecuniarily from this deportation, as not only the maintenance, erection, lighting, and heating of the prisons and hospitals, maintenance of officials, and contribution towards taxes in arrear by fugitive colonists, but also a portion of the cost of transporting the deported men has to be defrayed by them. It is to be wondered at that the government has not long ago stopped this deportation, which costs the country so much, and which contributes so little to the colonizing and clearing of the land.

IMPROVEMENTS IN THE MEANS OF COMMUNICATION.

In order to be in the position of being able to carry out the colonization of these lands, the government has had especially to consider the question of creating means of communication by which these distant parts could be brought nearer and joined to the mother country. This was particularly necessary, considering their high political value, on account of the very great distance and the very difficult transport—taking up much time—of troops.

A telegraph had already been laid in 1856 from European Russia to Nikolaievsk—the then chief town—which was connected with Vladivostok and Pekin in 1870. The Northern Telegraph Company, besides, laid a cable from Vladivostok to Nagasaki, and so connected the former town with the telegraph system of Eastern Asia and the world generally. This has the

great advantage that it forms during peace a good reserve for the imperfectly laid overland line, which often suffers long breaks in communication. The "telegraph net-work" of Eastern Siberia and China has also been completed during later years; so that to-day Port Arthur and Vladivostok are connected with all the large and important towns in these countries.

If the service of news has thus been improved, it has also been possible since 1878, owing to the formation of the company of the Volunteer Fleet, to form a state connection with Eastern Siberia. The journey, which formerly took several months, can now be performed in 40 days.

The first ships of the Volunteer Fleet were purchased during the war of 1878, and they formed a part of the navy, and were employed as auxiliary cruisers. After the war the Company of the Volunteer Fleet was founded with these ships. They perform during peace state commissions and transport service, with the object of maintaining regular postal, passenger, and goods conveyance between Odessa and the ports of the Pacific Ocean. In war-time the ships and equipments will be placed at the exclusive disposal of the naval authorities in order to be employed as cruisers or transports.

The Volunteer Fleet has performed, by the establishment of this regular steamer service between Odessa and the ports of the Far East, conspicuous service for Russia in administrative, strategical, and economic matters. The colonization of the most distant parts of Siberia is thereby directed in successful ways, and the despatch of the convicts to Saghalien has been organized, much simplified, and cheapened by its use. The conveyance of the post, troops, war materiel, and material for the building of railways has essentially increased its usefulness, and rendered the ships of other nations unnecessary.

The great disadvantages which communication by sea has, especially during war-time with a naval power, and the great material advantages which must devolve upon Russia by the use of a quick and secure communication by land, has resulted in projects for the building of railways ever since the occupation of these lands. After preliminary surveys were made respecting the line of route of the Siberian Railway, its construc-

tion was resolved upon in 1891, and the direction via Miasz, Tomsk, Krasnojarsk, Irkutsk, Tscheljabinsk, Strietensk, Chaborovsk to Vladivostok was settled.

The construction of the line was simultaneously commenced at several places, so that the line has already been given over for traffic as far as Irkutsk and likewise, in Eastern Siberia, the portions Vladivostok to Charborovsk, and Strietensk to Tschita. The original plan of building the line through the whole of Eastern Siberia, parallel to the Amur River up to Vladivostok, has been departed from. The portion between Strietensk and Chaborovsk has, apparently on account of the great difficulties to be surmounted, been given up, and communication by the Amur (which has existed since 1856) is deemed sufficient for the purpose—in the summer by steamer (seven days from Chaborovsk to Strietensk) and in winter on the ice.

In respect of this the Manchurian line has been commenced —details of which are given later on.

The cost of the Great Siberian Railway is estimated to amount to 350,210,482 roubles, *i. e.*, about 700,000,000 marks. The question whether any dividend will be earned by the line, time alone will show.

The importance of the line for the trade and industries of Russia is, however, without doubt, and cannot be sufficiently highly estimated. A little consideration of the advantages already obtained makes this quite clear. The line has, from a scientific point of view, been instrumental in the examination of the country, especially of the Amur region. An accurate topographical survey of 417,418 square miles on both sides of the line from Yakutsk to Vladivostok has been made for the first time. The waterways have been inspected for the purpose of making use of them to convey the necessary material for the construction of the railway. The country near the railway and of the waterways leading to it have likewise been examined from a geographical point of interest.

These researches have resulted in the discovery of 54 brown and pit coal mines, 20 gold, 40 copper, 15 iron, 2 lead, 2 plumbago, and 2 silver mines.

The regular connection of the centres of communication of

Siberia with one another and with European Russia has resulted in the large surfaces of cultivable land—the Siberian Railway runs through 7588 square miles by 100 square miles broad on both sides of the line, or 1,500,000 of square miles in all—a greater area, therefore, than Germany, Austria-Hungary, Holland, Belgium, and Denmark together—becoming colonized more quickly and systematically.

Further, industry has developed owing to the large coal and mineral possessions.

In commercial-political matters the opening of the railway has secured a great advantage, through the exceptional saving of time in the conveyance of goods between Europe and the East. Taking Shanghai as the centre of Eastern trade, this town can be reached from Berlin, via Talienwan, in about 18 days, instead of 31 via Suez, and 34 via Canada. The railway will thus become consequent on this very great saving of time, a great rival as a means of transport, and, according to the old commercial maxim, "Time is money," will convey a large portion of the expensive goods (tea and silk form 80 per cent. of the exports from China), passengers, and mails.

The influence of the Siberian Railway will not be felt much further south than Hong-Kong, for the mails, etc., to Singapore arrive in steamers via the Suez Canal in less time than will be the case when the Siberian Railway is in full working order; up till now the railway has only one set of rails, and, compared with European lines, is only primitively built. It has a very light superstructure and only wooden bridges, so that the speed of the trains may not exceed 32 kilometres an hour.

Moreover, by increasing the size and speed of the steamers of the East Asiatic lines, their efficiency to act as competitors will be considerably increased, so that before the main lines of the Chinese net of railways is completed—especially in the southern parts of Eastern Asia—a dangerous rival in the line is not to be looked for.

Russia, however, will obtain great advantages from the railway, not only as carrier but also as consumer and producer of most of the articles of the Northern East Asiatic trade. For not only in regard to its domestic economy, but especially in military-political relations, have the greatest advantages accrued to

Russia, because the conveyance of troops is not only very much accelerated, but also because the railway only runs through Russian territory—thus making it entirely secure. Three-fourths of the whole line is now finished, and even at the present time the transport of troops to the East is very much quickened. When the line is wholly completed, Siberia and Manchuria will, together with European Russia, become a great coherent military power.

The powerful army of the Tsar will then be in a position of being quickly concentrated with absolute safety at any point of danger, either in the East or West, from the shores of the Yellow Sea and Sea of Japan to the German, Austrian, and Roumanian frontiers. This will be more possible when the projected railways from Orenburg to Taschkent and Taschkent to Viernyi, Semipalatinsk, Banaul, and Kolywan are completed. By these lines, the 63,000 men who are present for military purposes in Turkestan and Transcaspia will obtain direct communication by land with European Russia, and in a north-easterly direction with the Chinese frontier along the Siberian line, so that in very exceptional circumstances the removal of troops also from the Afghanistan frontier to the East, or *vice versa*, could be easily accomplished.

As the military development of its fighting strength gives to each state its position in the Concert of the Nations, the railway will enable Russia to wield the baton in the East Asiatic Concert, which, in a not very far distant time, scarcely any other power will be in the position of succeeding in wresting from her. Herein is, therefore, the chief value of this gigantic railway.

As the survey of the projected portion of the line from Strietensk to Chabarovsk had disclosed great technical obstacles, Russia subsequently endeavored, in order to obtain direct railway communication with a port of Eastern Siberia, to obtain a concession from China to build a line through Manchuria. In the treaty of September 8, 1896, Russia obtained the right to do so, running from a station on the Transbaikal line through Manchuria to a station on the Usuri line. The "Russian-Chinese Bank" was then established to carry out the building of this "Eastern China" line. The foundation of this bank

was a step forward in Russia's endeavors to make China also financially dependent upon her. A treaty was concluded by the Imperial Chinese Government with the Russo-Chinese Bank, by which the Chinese East Railway Company was formed for the building and management of this projected line.

The company was given the concession for 80 years, dating from the opening of the line over its whole system. The shareholders can only be Russian and Chinese subjects. It is interesting to read the rules of this company as published by them, which clearly show that the Chinese East Railway Company is essentially a Russian one. A short extract will suffice to make this clear.

"The working of the Chinese East Railway Company must conform to that at the Russian junctions. The railway must receive, and forward on complete and at the same speed any trains from the Russian Railway. The width of the rails must be the same as that of the Russian line. The Chinese East Railway is under an obligation to lay a telegraph line along its whole line, to work it, and place it in connection with the telegraph line of the Russian Railway. It has to undertake the management of the telegraph line and forward all telegrams from Russia or China. The tariff for passengers and goods, as well as for telegrams, is settled by agreement between the company and the Russian government. These must not be raised during the whole period of the concession without the consent of the Russian government. The carriage of the Russian mail is to be performed gratuitously. In case of a difference of opinion, the Chinese East Railway has to accept as final the decision of the Russian Finance Minister. The company possesses the right, with the consent of the Chinese government, of working coal mines in connection with the railway or independent of it, and likewise to carry on other mining industries and commercial undertakings in China."

These two latter regulations are consequently particularly important, as they are valid for the construction of a branch railway towards the south and west (Port Arthur, Pekin, etc.), and later on will also be available for further Russian railway projects in China.

The railway leaves the Siberian line at Kaidalovo and runs

via Chailar, Bodunö, Kirin, and Ringuta to Poltavskaja, whence the Russian line runs to Nikolskoii and Vladivostok. Its length is estimated at about 1440 English miles. Its construction was commenced on October 1, 1898, and the intention is to have it ready for traffic by 1903.

After Russia took possession of Port Arthur and Talienwan on March 28, 1898, the building of a connecting line thence to the Chinese East Railway was at once commenced, the southern portion of which—Port Arthur, Talienwan, and Mukden—was opened on November 24, 1899, and joins the Chinese East Railway at Kirin.

As the technical difficulties to be surmounted on the Manchurian Railway have proved to be very considerable, and the shortening also is only, relatively speaking, small (152 miles), the great importance of this line is especially to be looked for in the commercial, and, above all, in the political and strategical advantages.

The constantly growing Russian industries will find a further great market in Manchuria. Especially will trade increase in the ports of Talienwan and Vladivostok, as it acquires a rich market easily made accessible by the railway running through Manchuria. The wealth in corn and minerals there will become of advantage to Russia. This is already insured by Russia and the Chinese East Railway Company being conceded the privilege, both in connection with the building of the railway and independently of it, of carrying on mining industry and commercial undertakings.

Manchuria still remains, politically, nominally a part of China; it is actually Russian territory. The Russian troops, which furnished protection to the Russian engineers in their preparatory work, and made ready for the occupation of Manchuria, have grown in numbers to be compact bodies of troops, and have encircled the Chinese frontier from Blogovinschtschenk to Port Arthur, and have taken possession of all the important towns of the country, and of the great roads to Pekin from Thitsikar, Budunö, Kirin, Ringuta, and Mukden. Russia has brought this large territory under her sway without the use of the sword (Manchuria is nearly double as large as Germany) by a skilfully meditated railway policy.

III.—POLITICAL AND MILITARY AIMS.

In acquiring the Amur and Usuri regions and the ports of Nikolaievsk and Vladivostok, Russia obtained so large an amount of territory and influential towns that they satisfied its immediate wants and the interests of Siberia. A precipitate haste in further forward movements was considered unnecessary, as it could well wait till circumstances in the East would change during the following decade to its advantage.

Russia was agreeable to a strengthening of Japan, as it saw in this power, the old enemy of China, an ally with whose assistance it hoped to accomplish its further plans in Korea and China.

Russia remained, consequently, completely quiet in East Asia up to 1895. During this time, however, it worked incessantly in Russianizing, cultivating, and strengthening its position in the recently acquired regions. Korea and Japan offered the nearest points of contact. In spite of the proximity of Russia to both of these countries, they have, nevertheless, entered into very little relationship with it.

The only subject of contention which has existed between Japan and Russia was before 1861, and that was in regard to Saghalien Island. This island never was occupied by Japan, but Japan always considered it belonged to her, as it is situated within the Japanese group of islands. In consequence of this, when Russia established two military posts there in 1853, Japan made a protest and concluded a commercial treaty with Russia in 1855, whereupon the latter removed the posts in question, after which both countries had the right to occupy the island and use it for agricultural purposes. In 1875, however, both powers agreed to a new treaty, because the situation created as regards Saghalien by the treaty of commerce of 1855 was untenable. In this new treaty Russia received Saghalien and Japan the Kurile Islands, which formerly belonged to Russia.

The whole position, however, of Russia as regards Japan and Korea suddenly changed after the war of 1895, which ended so fortunately for Japan. In this war the absolute military weakness of China was clearly demonstrated, and Russia perceived after the end of the war that the attainment of its far-reaching aims in Korea and in the Yellow Sea was opposed not by China, but by Japan.

In the treaty of peace of Schimonoseki, Japan had wrested from China, irrespective of her recognition of the complete independence of Korea, the relinquishment also of the southern portion of the province of Fingtien (the Liantung Peninsula), Formosa, the Pescadores group, and 300 millions of taels. Japan had thus won a position on the mainland which gave her, through its exceptionally favorable position, complete domination over North China, because Port Arthur and Talienwan are scarcely 3000 kilometers distance from Taku, and Pekin can be reached from both these places, which were to be equipped as modern military ports, in a few days.

It was these places in particular that Russia had decided upon as acquiring for herself, the great sacred traditions of the Russian Empire having always been to obtain there an ice-free port for Siberia. Russia's plaus in North China were, therefore thwarted, owing to the territory lapsing to Japan and the position which she thus obtained in this region.

Russia, in consequence of this, assisted by Germany and France, modified the treaty of peace of Schimonoseki in such manner that Japan neither received the peninsula of Liantung nor any other point on the mainland. It likewise reduced very considerably the great commercial advantages which Japan had endeavored to obtain from China. The war indemnity was reduced from 300 to 230 millions of taels, of which the odd 30 millions was paid in lieu of Liantung Peninsula.

Whilst Japan was kept shut out of the mainland of China, consequent on the reversion of the peninsula of Liantung, it hoped, nevertheless, to be able to make Korea independent; but here also Russia continued opposition. China had become, it is true, cut off by the treaty from all Korean concerns. In its place, however, the powerful Russia stepped in.

On October 8, 1895, the Queen of Korea was murdered. She had commonly been considered as the most important obstacle to the influence of Japan. Soon after the King of Korea sought refuge in the Russian Minister's house.

In the negotiations which followed between Japan and Russia, the latter obtained recognition from Japan of the entire independence of the Korean kingdom and the mutual obligation to refrain from interfering in the inner affairs of this country.

In case Korea needs the assistance of one of the two powers, Russia and Japan bind themselves not to take any steps without in the first place coming to a mutual understanding thereupon. Russia also undertook not to place hindrances in the way of Japanese trade. Thus Russia accomplished its object of causing Japan to resign for the present all the advantages which it had hoped to acquire in Korea by its war with China.

Korea remains to this day in the same helpless condition, which suits Russia, as before the war. Russian influence can secretly continue to work in order to again break out at a favorable moment after the completion of the railway and the settlement of more pressing tasks in Manchuria and south thereof. For here "time wins" for Russia as much as "power and influence." The many newspapers which have in recent times furnished intelligence respecting Russian purchases of land, etc., in Korean ports, testify in every instance to the fact that Russia is continually working in Korea—quietly, steadily, and with a definite object in view—like she is in all other parts of Asia.

This is a matter for consideration to England as well as to China. Whilst England had been paramount in Asia since her advent there, Russia has, during the last decade, succeeded in opposing her and Japan and obtaining a similar position. When Russia advanced her troops towards the frontier of Afghanistan, England occupied Port Hamilton, which commands the Korean Straits, and separates the sea connection of Vladivostok with the Yellow Sea. An energetic protest of Russia, accompanied by the simultaneous concentration of her military and naval forces at Vladivostok, effected, however, the evacuation of Port Hamilton by England.

The second great result of Russia against England was the restitution of the Liantung Peninsula, which had been ceded by China to Japan. For while Russia and Germany and France protested against the cession of this territory, together with the presence of Japan on the mainland, England took the opposite view in the hope that by the cession of this territory of China, Japan would become, as an Asiatic mainland state, a good buffer against the further advance of Russia.

The next gain by Russia was of a financial kind The war indemnity payable to Japan amounted to 230,000,000 taels. The

Russian Finance Minister Witte effected an agreement to loan, with the assistance of seven French and four Russian banking-houses, the sum required for the payment of the indemnity and for the reorganization of the Chinese army and navy. Under the direction of the Russian National Bank, they undertook to subscribe a loan of 400,000,000 francs, under the guarantee of the Russian government, in the event of the inability of the Chinese to pay. On the Chinese side the receipts of the Naval Custom House, not yet otherwise mortgaged, were assigned for the payment of interest and redemption of the debt. Thus, China was made financially dependent on Russia. In order to increase this dependency Russia established in 1896, with the assistance of the same banking-houses, the Russo-Chinese Bank already referred to.

Russia had already obtained, by the spring of 1898, the further and, perhaps, her greatest gain in China in acquiring for the period of twenty-five years—a term which can be prolonged by mutual understanding—the ports of Port Arthur and Talienwan, with adequate adjoining territory; exactly the two important places which Japan acquired in the war against China, the restitution of which Russia had required on account of their exceptionally favorable, from a political point of view, and excellent military position on the Yellow Sea.

The acquirement of both these ports, which were occupied on March 28, 1898, by Rear-Admiral Dubassow, was an advance exceptionally important for Russia in North China, and made it practically master of that land.

As a set-off against the advance of Russia in the north, England received from China the promise that it would never cede the Yangtse Valley to a foreign power. England also received the concession for building a railway from Shan-haik-wan to Neuchwang, which will run from Peking to Hsuimintan, and be built with the money of the Hong-Kong-Shanghai Bank. Owing to the mortgaging of this line as security for the loan, and as the chief engineer of the line and the chief officials of the staff were to be Europeans, Russia protested in Pekin. England was again induced by this interference of Russia to offer China her protection against any foreign oppression. Notwithstanding this, the demands of Russia were acceded to by China.

The subsequent negotiations between England and Russia, by which the former was allotted the Yanktse Valley, and the latter all the country north of the Great Wall, as spheres for railway concessions, accompanied by the obligation that both countries would not demand in each other's territory railway concessions for their respective subjects, but, on the contrary, would oppose them, appeared to form the commencement of the great partition of China.

In regard to the Shan-haik-wan-Neuchwang line, it was laid down in these negotiations that it should remain Chinese and under the control of the Chinese government. The government, however, was permitted to employ for the purposes of superintendence an English engineer as well as a responsible European. The Russian government reserved the right, however, to assist claims of Russian subjects, or the founding of railways which will branch off from the main line of the Manchurian Railway towards the southwest, and penetrate the region in which the Chinese line is built, which runs towards Hsuimintan and Neuchwang. Russia thus received a free hand to build further railways from the Manchurian main line to the southwest.

After the Chinese government had confirmed this English-Russian agreement, Russia put forward a fresh demand. This consisted in a junction railway with the Manchurian line running to Pekin. The direction of this line is not yet settled, but it will run to Pekin, branching from Kirin or Mukden. This will give Russia the advantage that it will be completely under Russian control, like the Manchurian line, that it will possess —contrary to the Shan-haik-wan-Neuchwang line—a Russian gauge, and, further, that it will be some distance from the Yellow Sea, in consequence of which it will be difficult for enemies' troops, which may have been landed, reaching and destroying it.

This advance movement is now temporarily interrupted owing to the outbreak of disorder in China, the end of which at the present time cannot be foreseen. That Russia will incur thereby permanent damage is not to be expected, looking at its previous record, and because it has not omitted, concurrently with its ever-growing interests and the constant increase of the

military forces of both its chief rivals, Japan and England, to bring its own land and naval forces in the East up to a strength which makes it master of the situation even in the so extraordinarily startling present commotion in China.

RUSSIA.

The strength of the Russian forces in Eastern Asia, *i.e.*, east of the Baikal Lake, is as follows (according to Count York von Wartenburg):

	Peace Strength. In Round Numbers.		War Strength. In Round Numbers.	
Field Infantry	35 Battalions	36,000 men	35 Battalions	36,000 men
Field Reserve Infantry.	2 "	2,000 "	10 "	10,000 "
Cavalry and Cossacks	35 Squadrons and Sotnias	6,000 horses	90 Squadrons and Sotnias	16,000 horses
Field Artillery	168 horsed guns	—	192 horsed guns	—
Engineers	3 Battalions	3,000 men	3 Battalions	3,000 men
Fortress Troops	38 Companies	10,000 "	38 Companies	10,000 "

The military district of the Amur (comprising the Amur region, Transbaikalia, the maritime province of Kwantung, and the department of Saghalien).

[Distribution, etc., of the Russian army, prepared by C. M. Major from Russian official sources.]

Chaborovsk Headquarters.— In command, Lieut.-General Grodekov, General-Governor.

A. Troops in the Brigade.

1. The East Siberian Rifle Brigade—Nikolsk Usuriski (maritime province).

1. The East Siberian Regiment—Rasdoluge.
2. " " " Nikolsk Usuriski.
3. " " " " "
4. " " " " "

2. The East Siberian Rifle Brigade—Novokievskoje (maritime province).

5. The East Siberian Rifle Brigade—Novokievskoje.
6. " " " " "
7. " " " " "
8. " " " " Barabasch.

3. The East Siberian Rifle Brigade—Port Arthur (Kwantung Peninsula).

9. East Siberian Rifle Regiment—Port Arthur (Kwantung Peninsula).
10. East Siberian Rifle Regiment—Port Arthur (Kwantung Peninsula).
11. East Siberian Rifle Regiment—Talienwan.
12. " " " " "

The East Siberian Rifle Artillery Division (3 batteries)—Port Arthur.

1. The East Siberian Line Brigade—Chaborovsk (maritime province).

3. East Siberian Line Battalion—Chaborovsk (maritime province).
6. East Siberian Line Battalion—Nikolaievsk.
8. " " " " { Count Muraviev Amurski. Staff at Iman.
10. " " " " Chaborovsk.

2. The East Siberian Line Brigade—Novgorodski (maritime province).

1. East Siberian Line Regiment—Vladivostok.
5. " " " " Slavjanka.
7. " " " " Vladivostok.
9. " " " " Novgorodski.
11. " " " " Saisonovka.

The Usuri Mounted Brigade—Nikolsk-Usuriski.

Chief Dragoon Regiment—Nasdolnoje.

1 Transbaikal Cossack Regiment—Nikolsk-Usuriski.

Usuri-Cossack Sotnia—Chaborovsk.

1. The East Siberian Artillery Brigade (8 batteries, including 2 breech-loading and 2 Mörser batteries)—Nikolsk Usuriski.

2. The East Siberian Artillery Brigade (4 batteries)—Blagovjeschtschensk (Amur).

1. The East Siberian Flying Artillery Park — Nikolsk Usuriski.

2. The East Siberian Flying Artillery Park—Nertschink (Transbaikalia).

B. Troops not Brigaded.

2. The East Siberian Line Battalion—Blagovjeschtschensk.
4. " " " "

Reserve Battalion Strietensk } In the towns of the same
" " Tschita } name in Transbaikalia.

Transbaikalia Artillery Division (2 batteries)—Nertschinsk (Transbaikalia).

The East Siberian Sapper Battalion—Chaborovsk.

Kwantung Sapper Company—Port Arthur.

1 Usuri Railway Battalion—Vladivostok.

South Usuri Train Cadre Company—Nikolsk-Usuriski.

C. Cossack Troops.

The Transbaikal Cossack army:

1. Werchue-Udinsk Mounted Regiment (Talienwan) } of 6 sotnias.
1. Tschita Mounted Regiment (South Usuri Mounted Brigade } = 24 sotnias.
I. Nertschinsk Mounted Regiment (Tschita)—1 to 3 levies.
1. Argun Mounted Regiment=72 sotnias.
1. Cossack Battery—Werchue-Udinsk.
2. " " Tschita.

Amur-Cossack Army—Blagovjeschtschensk=9 sotnias.

Amur-Cossack Mounted Regiment.

One-half Mounted Regiment=3 sotnias.

Usuri-Cossack Army—Vladivostok.

Usuri-Cossack Sotnia, South Usuri Mounted Brigade.

D. Fortress Troops.

Vladivostok:—

2 Fortress Infantry Regiments (of 3 battalions).
6 " Artillery Companies.
2 " Mining Companies.
1 " Sapper Company.
1 " Telegraph Division.

Novokievskoje (Possiet Bay):

1 Fortress Mining Company.
1 " Artillery Detachment.

Nikolaviesk:

1 Fortress Artillery Company.

Port Arthur:

6 Fortress Artillery Companies.

JAPAN.

The total peace strength of the Japanese army is as follows:

Generals and high officials	1,098
Officers	7,759
Junior officers, etc.	31,828
Cadets, etc.	4,520
Soldiers	358,566
Civilians	7,361
	411,132

It is divided into one division, forming the Imperial Guard, and twelve line divisions. Each division has two infantry brigades (2 infantry regiments, each of 3 battalions of 4 companies); armament, magazine rifles, Murata system, 8 millimetres, and magazine rifles, Arisaka system; 1 cavalry regiment (3 squadrons); armament (lances for the guard), sabres and carbines, Murata system; 1 field artillery regiment of 6 batteries of 6 guns; 1 pioneer battalion of 3 companies; 1 train battalion of 2 companies. The forces of the separate divisions, etc., are distributed as follows during peace, viz.:

Central Administration		9,937 men
Military Schools		5,033 "
Guard		8,419 "
1. Division,	Tokio	9,815 "
2. "	Sendai	8,484 "
3. "	Nagcya	8,365 "
4. "	Osaka	9,455 "
5. "	Hiroschima	8,278 "
6. "	Kumamoto	8,892 "
7. "	Mixed brigade as garrison of Formosa	4,005 "
8. "	Hirosaki	7,160 "
9. "	Komazawa	7,119 "
10. "	Himidzi	6,966 "
11. "	Marrugame	7,211 "
12. "	Kokoura	7,714 "
Reserves		72,174 "
Territorial Army		115,646 "
Recruits—Reserves		101,742 "
Gendarmerie		4,667 "
Total		411,132 men.

The troops are armed and equipped with modern weapons. The officers have studied, as is well known, with keen interest the armies of the world. The network of railways of the country has been exceptionally perfected during the last decade, so that the mobilization of the army, and likewise the conveyance for embarkation or to any threatened point in the land, can be very quickly carried out.

Japan will have at her disposal in 1903 an imposing navy and a large well-organized army, which will be considerably superior to the military forces of all other nations interested in Eastern Asia, in the event of their not sending out large reinforcements. It must further be assumed that the very patriotic, thinking Japanese will render especial services in a war against a European nation in which not only the existence of their country, but also their hatred of Russia is affected.

The Empire of Japan will, as a well-organized East Asiatic power, consequently have an important word in all East Asiatic questions.

It, however, will not alone be in the position of preventing Russia's progress if it is not assisted with funds by England. If Japan obtained the command of the sea during the commencement of war, Russia would be seriously affected, if she were not assisted by European allies, in her Eastern ports, but Japan would never be in the position of compelling peace. As the only very vulnerable part of Russia lies in Europe, and Japan has no base there, the latter's base will always be in Eastern Asia, and thus it would never be able, without allies, to transfer the seat of war to Europe. As Russia's policy is, however, to be on terms of friendship with the two greatest Continental Powers—Germany and France—and to ally herself with them, and England is prevented from opposing her for fear of losing India, and also of the Russo-Franco alliance, Russia can (as it has nothing to fear from a surprise from these three) spare more troops and ships from Europe than any other European State. The Dardanelles question would also not prevent Russia ordering her Black Sea fleet to the East in the event of war. Consequently Russia will be in a position of bringing a second fleet to the seat of war scarcely six weeks after its commencement. Although the total absence of Rus-

sian *points d'appui* on the road to Eastern Asia compels her to make very heavy coal provision for this additional squadron and its journey, consequently a matter of difficulty, the possibility of its comparatively speaking quick despatch is, nevertheless, without doubt.

The advantages gained by Japan on the East Asiatic mainland would also be tentative, as the additional troops Russia can bring against Japan are inexhaustible.

It may, therefore, be assumed that the great preparations Japan is making at the present time are not intended to carry on a costly war against Russia without a definite object in view, but are only to maintain her unapproachability, and to secure, when China is partitioned, the port of Amoy, which is so exceptionally important for Formosa, and also the province of Fukian—likewise to make it capable of becoming an ally with a European power with which it, perhaps, intends in a later decade to proceed on a favorable opportunity against Russia.

It is not expected that England, with its commanding navy but deficient army, will in the future proceed to extremities against Russia. It must always be a land power in Asia, and, consequently, would lose more than it could gain in India, which has Russia as a neighbor, and thus must always back down in order to avoid a conflict.

CONCLUSION.

It must be taken into consideration, when looking at the great success which Russia has had in Eastern Asia, that it possesses by its geographical position exceptional advantages for opposing China as compared with other rival nations.

When it is considered what enormous sums the construction of the railway, the Russian colonizing of Eastern Siberia and the maintenance of such a large military force in Eastern Asia costs, and by which the dominating position of Russia is alone secured, and by the assistance of which it can carry out its policy in Asia, it must be said that it has spared neither means nor men in order to turn to the best account the advantages given it by Nature.

Constantly, but without precipitancy, it has advanced step by step. Muraviev in the first place accomplished the peaceful occupation of Eastern Siberia, and whilst entering as little as

possible into negotiations with China, he ever pressed towards the south, and only concluded treaties if the political constellation was favorable for Russia, and if its fighting means were equal to any circumstances that might occur, so that the conclusion of the treaty—favorable for Russia—guaranteed it being treated with respect. When the country was ceded, its colonization and Russianizing was commenced by various means, and after the establishment of the necessary means of communication and a powerful fighting force, the hegemony of Russia in the East was made indisputable, so that Japan and England have been squeezed out of North China and Korea only by diplomatic negotiations.

Subsequently it made China financially dependent upon it with the assistance of French capital, and satisfied its own requirements, in the occupation of Port Arthur and Talienwan, two ports on the Yellow Sea possessing excellent strategical positions, by having an ice-free commercial port at the terminus of the great Siberian Railway, and an ice-free military port as a base for its fleet. Thus, and by the building of the Manchurian Railway, it has absolutely become the master of North China. If Russia remains at peace with the European Continental Powers, it is to be supposed that no power in the world will succeed in taking from it the hegemony of Eastern China.

The only state which can temporarily prevent Russia in her advances towards the South is Germany.

Germany can fight for her place in China on the European battle-fields. Thus Germany alone, as the greatest European military power, is able to exercise powerful diplomatic pressure on Russia. As, however, the German as well as the Russian government are imbued with the knowledge that both countries can best further their position in the world and the development of their own countries by a long peace, they have defined their spheres of action and interest in China by peaceful negotiations.

Between the lines of the Russian treaties of the past century is written, "North of the Hoang-ho is Russia's sphere of influence." If the position of our Colony of Kiau-chou be considered, the nearest hinterland of which is the province of Shantung, it must be seen that Germany, in case it does not

secure the further provinces between the Hoang-ho and the Yang-tse, in other words between the Russian and English spheres of interest, will be presumably in a few decades in approximately the same modest position in China as the Portuguese and French colonies are in India proper.

It would perhaps be possible for Germany, whose finances are considerably better than Russia's, to imitate in great style the so successful railway policy of Russia in the sphere of interest given to it by the existing circumstances. This could, however, only be carried out with a large expenditure of money, with military and naval forces and Russian indulgence.

Since Russia's advance in Manchuria has shown how it is inclined to seize any railway concessions, and since that power and England have respectively secured their spheres of railway concessions, we need not be in doubt one moment that the partition of China has begun. As, however, the Russian territory is always surrounded by great Custom boundaries, and the open-door policy of England will last only as long as it suits her, we are bound to secure as soon as possible, suitable to German trade, a market independent of these countries.

Military Notes.

JUSTICE TO THE ARMY.

IN the Act of Congress approved March 3, 1899, (30th Stats. at large, 1006–7) entitled: "An Act to reorganize and increase the efficiency of the personnel of the Navy and Marine Corps of the United States," Section 8 provides that certain officers of the line may apply for voluntary retirement and be retired with the next higher grade in the event of vacancies existing on the retired list of the navy, and Section 11 of the same act says: "That any officer of the navy with a creditable record who served during the Civil War, shall, when retired, be retired with the rank and three-quarters of the sea pay of the next higher grade."

Early in the first session of the present Congress, a bill for the retirement of army officers who served during the Civil War with the next higher grade was introduced and its passage recommended by the War Department, but thus far no action has been taken thereon in either house. It is stated upon good authority that there has been no interest displayed by army officers generally in the passage of this measure, and that therefore favorable action cannot be expected.

It is universally conceded that as a matter of equity, as well as justice, the officers of the army who have seen service in the Civil War, as well as in the Spanish American War, are entitled to the same consideration as the officers of the navy. While not desiring to make invidious comparisons between the two services, it is claimed for the army that the hardships and privations suffered by those who served their country on land have no parallel in the sister service.

It is, unfortunately, too often the case that in any measures pending before Congress relating to the army, the ordinary army officer fails to take an active interest when he is not per-

sonally benefitted by them. But let it not be forgotten that the recognition of faithful service in two wars, while rewarding but a portion of the mass of army officers, will in the end redound to the benefit of all and establish a precedent for like rewards in the future. It is, therefore, suggested that every army officer, no matter of what rank, exert himself with his Representatives in Congress for the purpose of obtaining justice for the army, so that it may be placed upon the same footing as the navy, in the matter of retirement.—*Army and Navy Journal.*

SWITZERLAND.

A correspondent at Berne kindly contributes the following information in a letter of November 14th :

"This is an exceedingly interesting country in a military way. It has no army yet. It has a force organized and equipped throughout of one hundred and fifty thousand men, that to me appear remarkably efficient for militia. I am sure you will be interested in reading Colonel Wm. Carey Sanger's report, prepared especially for the National Guard of New York State. He accompanied me during the manœuvres of the Third Corps d'Armée, and seemed much pleased, as I am sure I was, with the efficiency of the officers and discipline of the troops. Hard marches produced no straggling and from Saturday until Monday twenty-five thousand men were quartered in the city of Zurich, yet no disorders of any kind were reported. The officers are selected by competition and are full of enthusiasm, availing themselves of every opportunity to add to their store of military information. As a rule they have the confidence of their men, and maintain discipline without oppression."

FIELD HOSPITALS IN WAR.

Mr. Frederick Treves, who we understand will shortly publish a book upon ambulances, the subject-matter of which will have been gathered from his experiences in South Africa, read a paper at the late meeting of the British Medical Association treating of army medical matters in general. He said that the South African campaign had shown the value of a large mobile field hospital (taking three hundred to six hundred patients), which should immediately follow the colors ; such a hospital to

have its own transport. The campaign had also demonstrated the fact that the field hospital was no place for the female nurse, but that in the base hospitals they might be increased with advantage. When nurses were lacking, the orderly had to take their places, and he is an almost impossible person. He had to do manual labor as pitching tents, digging trenches, and then nurse complicated cases. Mr. Treves also urged the formation of an army medical reserve, by inducing recently qualified medical men to agree to serve for three years, one with the colors and two with the reserve. This reserve would be called upon only in time of war, and would enable the army medical department to avail itself of a body of specially trained medical men, who, from its point of view, would have the advantage of an army training. He was of the opinion that the services of men thus trained would be more valuable than those of a number of civilian surgeons chosen more or less irrespective of their qualifications. Mr. Treves' plan might commend itself to the adoption of our military authorities.—*Medical Record.*

AN IMPROVED TARGET.

A new target has been designed which, if adopted at rifle ranges, is likely to meet with much acceptance from riflemen who follow up shooting continuously. The new invention, says the *Newcastle Chronicle*, is the work of a local infantry volunteer, who has himself been a shooting member of his corps for many years. The targets at Bisley have not only to be pierced, but this fact has also to be known to the markers in the trench before the targets are pulled down and examined. Mostly, the marking at Bisley is good ; but every year there are very many cases of challenging when the firer thinks he has hit and the target does not go down. It is quite possible for the small bullet to go through the canvas without the marker below either hearing the sound or seeing the hole ; hence the disputes, and possibly those who do not care to challenge sometimes lose points. It is with a view to finding a remedy for this that the new target has been devised. A hit on any part of this target insures its disappearing below, which at once assures the shooter that he has made a hit. The target is held in position by a bolt which is attached to a steel plate, one-third the size of a

canvas target, and fixed in the rear of the centre of the target. Four thin steel plates are cut and fitted on the iron sliding frame to form a funnel, the wide end to cover the target in the rear, and the narrow end to cover the bolt plate, so that every shot that goes through the target will draw the bolt and allow the target to drop into the marker's trench. The same target could be used up to any distance. A rope is fixed to the bottom of the target and brought through a ring or runner in line with the bottom of the target when in position, so that by pulling the rope in the trench the target comes up again after being patched. The discs for marking are at once both simple and effective. These are fitted on to the iron frame like flaps, two on either side and worked by the marker by means of handles which are entirely out of sight at the firing point. It is confidently anticipated that the trenches, which are now carried well back to allow the marker to see the bullet hole, would not need to be near so roomy, as the target by going down tells of itself when there has been a hit. The device is an admirable one, and is the result of much patience and forethought.

ENGLISH MEDAL FOR SOUTH AFRICAN WAR.

Several descriptions of the official medal for the South African War have been published, but as yet no authoritative account of it has appeared. The following particulars have, however, been gleaned from an army officer of high rank, who is one of the few in the secret. According to this officer the medal will be circular in shape, and, as has already been hinted, the Queen's head will be on the obverse. On the reverse we understand that there will be two panels, one representing the army and the other the navy, the latter part of the design being a tribute to the work of the naval brigade. Overshadowing both panels will be a figure of Peace crowning the figures with a wreath of laurel. The ribbon will be in three colors, the two outer being scarlet and the next two navy blue, while the central band will be a brilliant orange. Only two bars have yet been decided on —one for Ladysmith and the other for Kimberley. It is probable, however, that a bar will be given for Mafeking, and the soldiers who were at Paardeberg expect a bar for that.—*United Service Gazette.*

LOOTING IN CHINA.

During the recent looting in Pekin the plunder that fell in the missionaries' way was a great burden on the minds of these good men. The correspondent of the New York *Sun* tells how this question of casuistry disturbed their peace. They considered it unrighteous to appropriate it themselves, and somebody was certain to take it. The Russians, for instance, would have no scruples. So they finally adopted the expedient of selling the spoils and applying the proceeds to the needs of the Chinese converts. So the headquarters of the mission was the scene of commercial activity for several days. Army officers and civilians, bent on acquiring souvenirs of the campaign, have gone with their money and come away laden with genuine relics of rich Pekin. These persons are, perhaps, now sorting over their stock of loot purchased or acquired otherwise, and wondering how much of it they will be able to transport or to pay duty on for returning home—*United Service Gazette.*

PLAIN CLOTHES WHEN OFF DUTY.

It is worth noting that at a time when the constant wearing of uniform by officers off as well as on duty is being strongly insisted upon as a most necessary reform, a Staff Officer, in a paper printed in the *Pall Mall Magazine*, to which we have referred elsewhere in our columns, insists equally strongly that the rank and file of the army as well as the officers, should be permitted, and in fact encouraged, to wear plain clothes when off duty. Allowing that theoretically the soldier, officer, and man alike should be so proud of his uniform that he would prefer to wear it continually, the Staff Officer points out the many very easily understandable reasons why the permission to wear plain clothes would be welcomed by the non-commissioned officers and men of the army. "The soldier," he says, "is no more ashamed of his uniform than the judge of his wig, or the policeman of his blue tunic, but all these prefer the seclusion of plain clothes at times." "No Englishman," he continues, "likes to be continually dressed for duty. The fact that officers of the army and navy, undergraduates of the universities, lawyers, policemen, postmen and railway porters and officials generally, invariably discard their official uniform on the earliest opportu-

nity, illustrates that this tendency is deeply rooted in our national life, and must be accepted as one of the characteristics." The Staff Officer further believes that the more general wearing of plain clothes would not only be very popular in the army, but it would also add to its prestige. One of the chief reasons, he maintains, that our police force is so highly respected is the fact that the ordinary citizen has never seen a policeman except while on duty. Were he to see Robert in uniform taking his ease and his beer at the local public, after hours, or possibly embracing the cook on a seat in the park, with his regulation helmet at a comportable angle at the back of his head, some of this respect might possibly diminish. But with the unfortunate soldier any dalliance is immediately advertised, by reason of the man's clothes, to the entire neighborhood. Few people notice a drunken civilian—everyone a drunken soldier; and it is perfectly patent that our army and navy suffer by the unseemly behavior of their bad characters to a degree that is not possible in any other trade or profession. There is undoubtedly much that is true in these remarks, but at the same time a general permission to all ranks to wear plain clothes might be found in practice to be attended with certain inconveniences, which will perhaps suggest themselves more readily to a regimental than to a staff officer, if the latter has been long away from regimental life and duty; and, therefore, although the experiment might be tried tentatively on a small scale, it would be well to note the result of such a trial before deciding upon the general introduction of so radical an alteration in the custom of armies.—*Army and Navy Gazette.*

OUR MILITARY ATTACHÉ AT PARIS.

Major Mott, the United States Military Attaché who was present at the French manœuvres, has given expression to his feeling of satisfaction with all he saw. He came away with a golden opinion of the infantry, and says they are not merely splendid marchers, but keep up their spirits in trying circumstances, and are as ready in supplying their own wants as any soldiers he has ever met. The cavalry struck him as being quite different in their methods from what he was familiar with at home. Americans regard cavalry as the eyes and ears of the

forces, and expect them to act as mounted infantry, while the French still employ masses of cavalry and regard charges as still perfectly feasible. Major Mott thought the horsemanship of the French officers excellent. They have been described as poor riders, he says, but they demonstrated the contrary in the fine display they made round Chartres. He was also very much pleased with the artillery. The new gun appeared to him to be a most efficient weapon, and to involve a new method of working which is a vast improvement on the old style. "The French artillerymen know their business, too, and their prompt and effective manœuvring, combined with rapid serving of the guns, is simply admirable." Another point that impressed him was the use made of motor-cars, though he does not think that they would be of great value on rough American roads, and over the enormous tracts of country which might have to be traversed in the United States.—*Army and Navy Gazette.*